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THE MODERATING EFFECT OF INDUSTRY REGULATIONS ON THE RELATIONSHIP BETWEEN TECHNOLOGY DEPLOYMENT STRATEGIES AND PERFORMANCE OF COMMERCIAL BANKS IN KENYA

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Abstract: *This study investigated the moderating effect of industry regulations on the relationship between technology deployment strategies and the performance of commercial banks in Kenya. The study adopted a quantitative research design and was guided by the Unified Theory of Acceptance and Use of Technology (UTAUT). Primary data were collected through structured questionnaires administered to selected commercial banks in May 2025. The analysis employed regression modeling to test moderation effects. The findings revealed that regulatory frameworks significantly enhance bank performance by fostering creativity, inclusivity, and resilience. Key legal instruments influencing technology adoption include the Kenyan Constitution (2010), the Prudential Guidelines (2013), and the Digital Credit Providers Regulations (2022), which supported the financial sector's stability during shocks such as the COVID-19 pandemic. The study recommends updating outdated policies, such as the Banking Act (2015) and the Prudential Guidelines (2013), to accommodate emerging technologies like fintech, blockchain, and artificial intelligence. Additionally, policymakers are urged to enhance financial inclusion through financial literacy programs, localized digital innovations, and targeted support for marginalized groups, including women-led enterprises.*

Key Words*: *Technology Deployment, Industry Regulations, Banking Performance, Commercial Banks

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1. INTRODUCTION

Advances in financial technologies, such as blockchain, digital payment systems, mobile banking, and artificial intelligence (AI), have caused a significant digital transformation in Kenya's banking industry. Customer satisfaction, operational efficiency, and overall bank performance have all been greatly improved by these innovations (Njenga & Njeru, 2023; Kimutai et al., 2022). For example, M-Pesa and other mobile money services have played a key role in advancing financial inclusion, offering affordable financial services to the unbanked, and growing banks' clientele (Ndung'u et al., 2022; Otieno & Mwangi, 2023). Despite the fact that these technologies have many advantages, their effect on performance depends on the regulatory framework that controls their use and adoption (Rabbani et al., 2023).

There is a significant knowledge vacuum regarding how industry regulations in Kenya moderate the relationship between technology deployment strategies and bank performance. The majority of the literature currently in publication concentrates on the broad advantages and difficulties of adopting technology, but it ignores the complex ways in which regulatory frameworks influence these results, especially in developing nations like Kenya (Mwangi & Njuguna, 2021; Wachira et al., 20%3). To maintain sector stability, regulations like those issued by the Central Bank of Kenya (CBK) address important topics like cybersecurity, data protection, and digital banking operations. However, smaller banks may find it difficult to meet these regulations because they frequently call for large investments (Otieno & Njeru, 2023). Anti-money laundering (AML) and data privacy regulations, for instance, necessitate sophisticated technological systems, resulting in differences in compliance capacities.

By investigating the moderating impact of industry regulations on the relationship between technology deployment strategies and commercial banks' performance, this study fills a gap in knowledge. This study emphasizes how policies affect operational efficiency, profitability, and competitiveness by concentrating on Kenya's distinct regulatory environment, including the Prudential Guidelines (2013) and the Digital Credit Providers Regulations (2022). The study also looks at how carefully drafted regulations can increase consumer trust, reduce cybersecurity risks, and advance financial inclusion (Mutua & Korir, 2023; Sun & Liu, 2022). The development of balanced regulatory frameworks that support long-term technological innovation while preserving financial stability will be aided by these insights.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Problem Statement

Global financial services have changed as a result of the banking industry's adoption of technology, which has brought about advantages like increased financial inclusion, better customer service, and operational efficiency. Nevertheless, even though Kenya leads Africa in digital financial solutions, many commercial banks there struggle to successfully implement technology to improve important performance indicators like ROA, operational effectiveness, and customer satisfaction. Only 17% of Kenyan commercial banks have fully integrated digital technologies, with the majority still in the early stages of implementation, despite the potential for performance-boosting capabilities of technologies like data analytics, digital payment systems, and mobile banking (Kinyanjui, 2020). Banks' capacity to benefit from technology breakthroughs is restricted by this fragmented adoption, which leads to less-than-ideal performance results.

Financial limitations, poor infrastructure, and a shortage of qualified staff are some of the particular challenges faced by smaller banks. These difficulties are made worse by rising worries about data privacy and cybersecurity risks, which necessitate large expenditures to meet legal requirements. Even with these expenditures, technology adoption hasn't always resulted in quantifiable performance gains like greater customer satisfaction or profitability. Banks' capacity to satisfy customer demands and adhere to changing regulatory requirements is weakened by the absence of structured approaches to technology deployment, which also increases operational costs and exacerbates inefficiencies.

Previous research emphasizes how technology improves financial performance (Kangogo, 2018; Muttai, Njoka, & Muchira, 2023), but it doesn't look at whether banks use structured strategies or how closely they match performance goals. Furthermore, little is known about how the regulatory environment affects the adoption of technology. Although laws like the Data Protection Act of 2019 and the National Payments System Act are essential for maintaining compliance and financial stability, little is known about how they moderate the relationship between performance and technology deployment strategies.

In order to address these issues, regulatory frameworks play a critical moderating role. Regulations can influence how technology is adopted and how it affects bank performance. While excessively strict requirements may put a strain on banks' resources, especially for smaller institutions, clear and balanced regulations can promote innovation, ensure compliance, and improve financial inclusion. This study intends to shed light on how Kenyan banks can best deploy technology to increase operational effectiveness, comply with regulations, and produce long-term performance results by evaluating the moderating impact of industry rules.

2.2 Research Objective

To assess the moderating effect of industry regulations on the relationship between technology deployment strategies and the performance of commercial banks in Kenya.

2.3 Research Hypothesis

Industry regulations have no significant moderating effect on the relationship between technology deployment strategies and the performance of commercial banks in Kenya.

2.4 Theoretical Framework

The Unified Theory of Acceptance and Use of Technology (UTAUT) served as the foundation for the investigation. Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT), which uses four main constructs to explain user intentions to adopt and use technology: facilitating conditions (technical and organizational support), social influence (peer and organizational pressure), performance expectancy (the belief that technology improves performance), and effort expectancy (ease of use). Gender, age, experience, and voluntary use all act as moderators of these constructs. Although UTAUT has been widely used to study technology adoption, it has come under fire for assuming voluntary technology adoption, oversimplifying decision-making, and ignoring cultural and economic factors (Bagozzi, 2007; Dwivedi et al., 2019). These drawbacks are particularly noticeable in highly regulated sectors, such as financial services, where adoption is frequently motivated more by compliance needs than by free will.

Economic and regulatory limitations have a major influence on the adoption of technology in Kenya's financial sector, especially in commercial banks. Effective technology deployment is hampered by a lack of funding for staff training, infrastructure upgrades, and system maintenance, as noted by Wekesa and Ouma (2022). Additionally, banks are forced to adopt technologies in order to comply with stringent regulatory mandates from organizations such as the Central Bank of Kenya. These mandates include security and reporting standards. According to Onyango and Otieno (2024), such involuntary adoption could jeopardize new technologies' operational integration and perceived benefits. Additionally, organizational culture affects how quickly technology is adopted; in contrast to agile fintech environments, hierarchical structures slow adoption (Kimani & Mwangi, 2023).

In order to overcome these constraints, the study "To Assess the Moderating Effect of Industry Regulations on the Relationship between Technology Deployment Strategies and Performance of Commercial Banks in Kenya" looks at how industry regulations function as a moderating factor. Regulations frequently dictate how and when technologies are deployed, even though performance expectancy and effort expectancy continue to be important predictors of technology adoption (Makena & Otieno, 2022). According to Kariuki et al. (2023), this regulatory-driven adoption may have an impact on the profitability and efficiency results of commercial banks.

This study expands on UTAUT by adding industry regulations, which better capture the realities of Kenya's banking sector, where technology deployment strategies are shaped by regulatory compliance. For adoption and performance to be successful, enabling factors like IT infrastructure and regulatory support are also essential (Wambugu et al., 2021). A thorough grasp of how commercial banks can overcome these limitations to maximize technology deployment for enhanced organizational performance is provided by acknowledging the moderating influence of industry regulations.

The conceptual framework for comprehending Kenyan commercial banks' technology adoption and deployment was the Unified Theory of Acceptance and Use of Technology (UTAUT). Performance expectancy in this study is consistent with metrics used to assess bank performance, including financial performance outcomes, customer satisfaction, and operational efficiency. Indicators like system compatibility, staff adaptability, and ease of use reflect the perceived ease of integrating new systems, which is correlated with effort expectancy. Variables measuring organizational culture, leadership commitment, and peer pressure to adopt technology were used to capture social influence. Indicators like the availability of internal support systems, training, and IT infrastructure served as representations of the enabling conditions. Both the questionnaire's design and the analysis of the effects of technology deployment strategies on performance were informed by these constructs.

By using variables that measure compliance requirements, legal constraints, and regulatory alignment, the moderating role of industry regulations was operationalized. Regulations had an impact on banks' perceptions of the practicality and usability of technological advancements. The adoption of secure digital platforms, for instance, was impacted by adherence to Central Bank of Kenya guidelines, which strengthened performance expectations. However, by adding complexity and causing delays in implementation, strict regulations may reduce effort expectations. On the other hand, regulatory support and clarity made adoption processes easier, which served as a facilitating condition. This study offers a more contextualized understanding of how mandatory compliance can either strengthen or limit the impact of UTAUT constructs on technology deployment and performance in the banking industry by incorporating regulation into the UTAUT model.

2.5 Empirical Review

Numerous studies have examined the moderating impact of industry regulations on the relationship between commercial banks' performance and technology deployment strategies, each providing important insights into this intricate interaction. The importance of regulatory frameworks in influencing the uptake, efficacy, and influence of technology in financial institutions is highlighted by these studies.

Using a mixed-methods approach, Elms and Low (2019) investigated the connection between industry regulations and the implementation of technology in financial services. Their research showed that strict laws frequently impede the adoption of new technologies. Financial institutions that strategically match their technology deployment with regulatory requirements, however, typically see improved performance outcomes, such as increased stakeholder trust and operational efficiency. By reducing regulatory risks, this strategic alignment emphasizes how crucial it is to incorporate compliance into technology strategies.

Kim (2020) used a case study of South Korean banks and startups to investigate fintech innovation in banking. The study showed that stringent regulations can eventually create a stable and secure environment for fintech innovation, even though they may initially slow the adoption of new technologies. Improved customer satisfaction and financial stability resulted from proactive interactions with regulators and the integration of regulatory changes into technological practices, suggesting that performance depends critically on the ability to adjust to regulatory requirements.

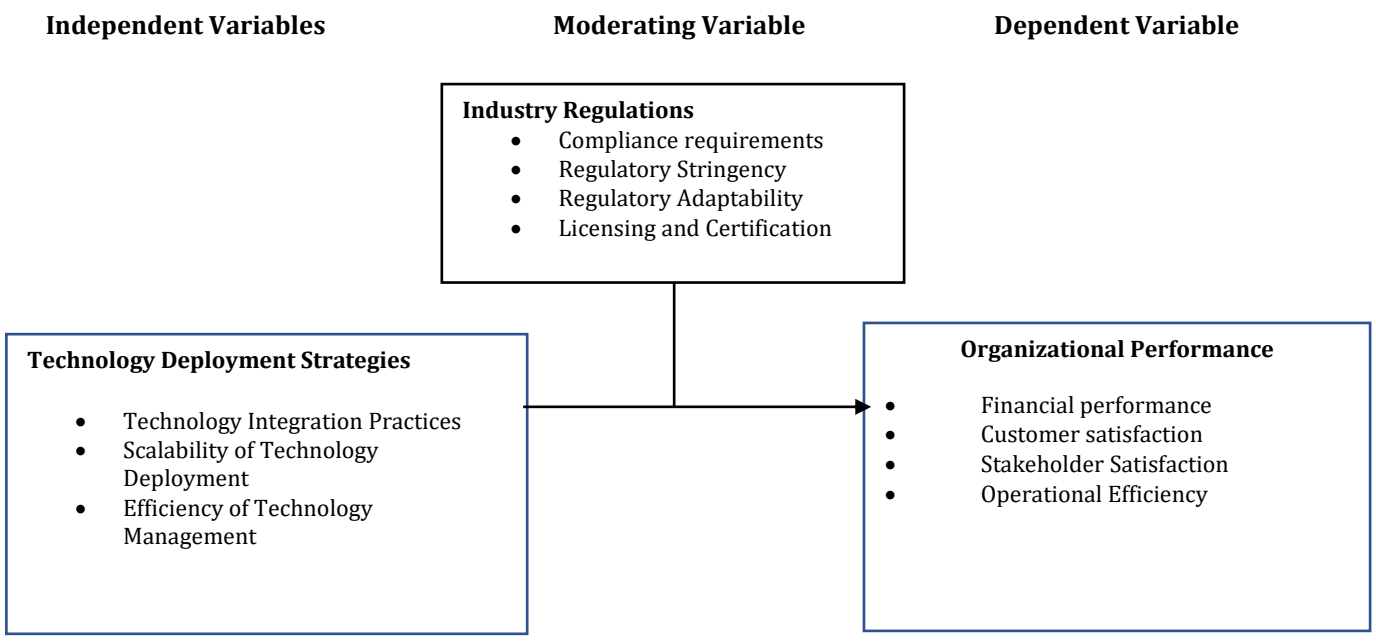
A long-term study on technology adoption in the insurance industry under regulatory restrictions was carried out by Gupta and Pal in 2021. They discovered through econometric modeling that regulatory constraints have a major impact on the rate and extent of technology adoption. Better operational performance and risk management were attained by insurers who created flexible procedures to adhere to changing regulations, providing important insights into how compliance tactics can boost competitiveness.

In their 2022 study, Johnson and Lewis concentrated on the healthcare industry, emphasizing how regulatory agencies moderate the connection between organizational performance and technology deployment. Strict adherence to regulatory standards reduces compliance risks and enhances results, according to their survey-based study, with regulatory-compliant technologies resulting in fewer operational disruptions and increased efficiency.

A comparative study of the technological practices and regulatory frameworks in the telecom sector was presented by Wang and Zhou (2023). Their results demonstrated that transparent and encouraging regulatory frameworks improve technology deployment efficacy and promote improved performance levels. The need for clarity and balance in regulatory policies is demonstrated by the way that unclear or overly restrictive regulations stifle innovation and diminish overall effectiveness.

Together, these studies support the importance of industry regulations as a moderating factor in the association between organizational performance and technology deployment strategies. These findings are especially pertinent to Kenyan commercial banks, whose technological innovation and regulatory requirements are changing quickly. According to the findings, banks should proactively interact with regulatory agencies and implement structured, flexible compliance strategies in order to optimize the advantages of technology implementation. This alignment can improve operational effectiveness, customer satisfaction, and financial performance while assisting in overcoming obstacles like cybersecurity threats, data privacy issues, and budgetary limitations.

Figure 1: Conceptual Framework



Source: Author

3. METHODOLOGY

An overview of the procedures and methods used to conduct the study was given in this chapter. The target population, sampling strategies, data collection processes, data analysis methodologies, and research design were all covered.

3.1 Research Philosophy

Since the study's quantitative methodology aimed to measure and quantify the effects of technology deployment strategies on Kenyan commercial banks' performance in an objective manner, positivism was a suitable philosophical position for this investigation. With an emphasis on facts and cause-and-effect relationships that could be examined statistically, positivism promoted the use of observable and quantifiable data. Because the goal of the study was to measure how different technology deployment strategies like integration, scalability, management effectiveness, and regulatory influences affect organizational performance, a positivist approach made sure that the data gathered was trustworthy, objective, and able to be statistically analyzed to produce conclusions that could be applied to other situations. As a result, positivism was the best philosophy to guide the research methodology and guarantee that the findings were supported by empirical evidence, which was in line with the study's objective of identifying patterns and relationships between variables.

3.2 Research Design

The research design used in this study was descriptive. For studies that sought to gather data that described existing phenomena—in this case, the current status of technology deployment strategies within Kenyan commercial banks—a descriptive design was suitable. It made it possible for the researcher to methodically gather information from a wide range of respondents at a particular moment in time, offering a thorough overview of institutional procedures, difficulties, and results. It facilitated the analysis of trends and correlations between factors like scalability, management effectiveness, technology integration, and compliance with industry standards. Additionally, the descriptive design was practical for reaching a large sample across several financial institutions and was economical and time-efficient. It made it easier to gather information from strategic staff and decision-makers without requiring long-term monitoring. In the end, this design made it possible for the researcher to examine and record how industry regulations moderate the relationship between Kenyan commercial banks' performance and their technology deployment strategies.

3.3 Population of the study

All 39 commercial banks with operating licenses in Kenya made up the population of this study, which served as its unit of analysis. The total population of units of observation was 39 IT Managers, Chief Technology and Operations Officers, Chief Information Officers, or Chief Technology Officers (CTOs) across the 39 commercial banks, ensuring a comprehensive and representative sample that captured the full scope of factors influencing organizational performance through technology deployment, thereby providing a robust basis for data collection and analysis.

3.4 Sampling Procedure and Sample size

The study adopted a census design, meaning that all 39 commercial banks licensed and regulated by the Central Bank of Kenya were included in the study. The respondents were one IT Manager, Chief Technology and Operations Officer, Chief Information Officer, or Chief Technology Officer (CTO), as they were responsible for overseeing technology adoption, integration, and management within their respective banks.

3.5 Instrumentation Data Collection Procedures

The type of data collected in the study was primary in nature. The data was collected using self-administered questionnaires. Prior to conducting the study, permission for the respondents' participation was sought from the financial service organizations. In order to identify any possible issues with the questionnaire's structure or readability, a pilot study was also carried out before the data collection activities. Respondents' attitudes, perceptions, and opinions about the moderating influence on the relationship between technology deployment strategies and Kenyan commercial banks' performance were gauged using Likert scale questions. Data was collected in May 2025.

4. RESULTS

The study identifies a number of important regulatory frameworks that have a big impact on how technology deployment strategies and Kenyan commercial banks perform. By guaranteeing compliance, security, financial inclusion, and customer protection, these regulatory provisions influence the adoption of cutting-edge technologies and improve banking performance.

4.1 Descriptive Statistics

Industry Regulations

The Central Bank of Kenya and other industry regulations influence how banks use and deploy technology. These rules address things like operational compliance, digital transaction guidelines, data security, and anti-money laundering systems. The relationship between technology deployment strategies and performance outcomes is examined in this subsection in light of such regulatory frameworks. It investigates whether rules encourage innovation or impede the adoption of new technologies

because of compliance requirements. The study shows how regulation affects the strategic impact of technology in Kenyan commercial banks by evaluating this moderating effect. The results are displayed in Table 1.

Table 1: Industry Regulations

Statement	NA	SE	ME	GE	VGE	Mean	SD
Industry regulations have enhanced the effectiveness of our technology deployment strategies.	0	2 (5.6%)	10 (27.8%)	18 (50.0%)	6 (16.7%)	3.78	0.8
Compliance with industry regulations has led to improved performance of our technology systems.	0	0	9 (25.0%)	23 (63.9%)	4 (11.1%)	3.86	0.59
Strict industry regulations have facilitated better alignment between technology deployment and organizational goals.	0	5 (13.9%)	5 (13.9%)	17 (47.2%)	9 (25.0%)	3.83	0.97
Regulatory frameworks have positively influenced the impact of technology deployment on our financial performance.	0	4 (11.1%)	10 (27.8%)	17 (47.2%)	5 (13.9%)	3.64	0.87
Adherence to industry regulations has mitigated risks associated with technology deployment.	0	1 (2.8%)	10 (27.8%)	17 (47.2%)	8 (22.2%)	3.89	0.79
The effectiveness of our technology deployment is significantly affected by the regulatory environment.	1 (2.8%)	4 (11.1%)	10 (27.8%)	17 (47.2%)	4 (11.1%)	3.53	0.94
Compliance with industry regulations imposes additional costs on our technology deployment practices.	0	2 (5.6%)	12 (33.3%)	14 (38.9%)	8 (22.2%)	3.78	0.87
Industry regulations impact the ability of our organization to innovate with new technologies.	0	2 (5.6%)	16 (44.4%)	13 (36.1%)	5 (13.9%)	3.58	0.81
Aggregate						**3.74**	**0.83**

Source: Author

The analysis of the moderating effect of industry regulations on technology deployment and performance in Commercial banks in Kenya reveals an overall positive perception of regulatory influence. The aggregate mean score of 3.74 and standard deviation (SD) of 0.83 indicate that most respondents agree that industry regulations significantly shape how banks deploy technology, though with moderate variability in opinions.

The statement "Compliance with industry regulations has led to improved performance of our technology systems" received the highest mean score of 3.86 with a low SD of 0.59. A large majority, 23 respondents (63.9%), agreed to a great extent (GE), while 4 (11.1%) agreed to a very great extent (VGE), and 9 (25%) to a moderate extent (ME). This strong agreement suggests that compliance not only fulfills legal requirements but also contributes to technological efficiency and operational effectiveness.

The second-highest scoring item, "Adherence to industry regulations has mitigated risks associated with technology deployment", achieved a mean of 3.89 and an SD of 0.79. Notably, 17 respondents (47.2%) agreed to a great extent and 8 (22.2%) to a very great extent. Another 10 (27.8%) rated it moderate, and only 1 (2.8%) said small extent (SE). This emphasizes the protective role of regulations, especially in areas such as cybersecurity, data privacy, and risk management.

On the statement "Strict industry regulations have facilitated better alignment between technology deployment and organizational goals," the mean score was 3.83 with a relatively high SD of 0.97, suggesting varied responses. While 17 respondents (47.2%) agreed to a great extent and 9 (25%) to a very great extent, 5 (13.9%) each responded small extent and moderate extent. This indicates that for many institutions, regulations have helped align tech initiatives with business objectives, though some face challenges in achieving this synergy.

Regarding the influence on financial performance, the statement "Regulatory frameworks have positively influenced the impact of technology deployment on our financial performance" scored a mean of 3.64 (SD = 0.87). Here, 17 (47.2%) agreed to a great extent, 10 (27.8%) to a moderate extent, and 5 (13.9%) to a very great extent, while 4 (11.1%) reported only a small extent. This implies that while regulations may support profitability and operational success, the magnitude of their influence varies across institutions.

The statement "Industry regulations have enhanced the effectiveness of our technology deployment strategies" received a mean of 3.78 (SD = 0.8), with 18 respondents (50%) agreeing to a great extent, 10 (27.8%) to a moderate extent, and 6 (16.7%) to a very great extent. Only 2 (5.6%) noted a small extent. This reinforces the view that regulatory structures, particularly those from bodies like the Central Bank of Kenya, improve the quality and execution of tech strategies.

In terms of costs, the statement "Compliance with industry regulations imposes additional costs on our technology deployment practices" had a mean of 3.78 and SD of 0.87, where 14 (38.9%) agreed to a great extent, 12 (33.3%) to a moderate extent, and 8 (22.2%) to a very great extent. This indicates a clear recognition that compliance, while beneficial, introduces notable financial burdens.

Concerning innovation, "Industry regulations impact the ability of our organization to innovate with new technologies" had a mean of 3.58 (SD = 0.81). 16 respondents (44.4%) agreed to a moderate extent, 13 (36.1%) to a great extent, and 5 (13.9%) to a very great extent. Only 2 (5.6%) rated it as a small extent. These results suggest that although some banks feel constrained, others are managing to innovate within the regulatory framework.

The lowest scoring item was "The effectiveness of our technology deployment is significantly affected by the regulatory environment" with a mean of 3.53 and SD of 0.94. 17 respondents (47.2%) agreed to a great extent, 10 (27.8%) to a moderate extent, 4 (11.1%) to a small extent, 1 (2.8%) to no extent (NA), and 4 (11.1%) to a very great extent. This reflects some divergence in opinion, suggesting that while many banks feel strongly affected by the regulatory climate, others do not see it as a primary determinant of technology outcomes.

In summary, most respondents agree that industry regulations in Kenya positively influence technology deployment strategies and risk management, though they also introduce cost pressures and may inhibit innovation in some cases. The relatively consistent agreement across items, with mean scores ranging from 3.53 to 3.89, suggests that while the regulatory framework is largely enabling, its effects vary depending on each bank's context, capabilities, and strategic alignment.

Moderating Effect of Industry Regulations

To investigate the moderating effect of industry regulations on the relationship between technology deployment strategies and the performance of commercial banks in Kenya, a moderated regression analysis was conducted, following the well-established steps outlined by Baron and Kenny (1986). This method allows for a thorough examination of how the presence of a moderator (in this case, industry regulations) affects the strength or direction of the relationship between independent variables (technology deployment strategies) and the dependent variable (bank performance). Below is a detailed explanation of how the analysis was carried out, following Baron and Kenny's approach. In this first step, the focus is on examining the direct effects of the independent variables—technology integration practices, scalability of technology deployment, and efficiency of technology management—on the dependent variable, which is the performance of commercial banks in Kenya.

The second step involved testing whether industry regulation moderates the relationship between technology deployment strategies and bank performance. Baron and Kenny's method suggests that a moderator variable influences the strength or direction of the relationship between an independent variable and a dependent variable.

In the third step, to formally test for the moderating effect of industry regulation on the relationship between technology deployment strategies and bank performance, we introduced an interaction term between the independent variables (technology deployment strategies) and the moderator (industry regulation).

Table 2: Moderating Effect of Industry Regulations

Model Summary					
Model	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
1	0.814	0.662	0.643	0.295	
2	0.896	0.803	0.791	0.267	
ANOVA					
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	6.89	3	2.296	26.84	0.000
2	7.531	4	1.883	33.2	0.000
Coefficients					
Variable	**Unstandardized Coefficients (B)**	**Std. Error**	**Standardized Coefficients (Beta)**	**t**	**p-value**
(Constant)	0.453	0.232	-	1.95	0.058
Technology Integration Practices	0.514	0.134	0.398	3.83	0.001
Scalability of Technology Deployment	1.951	0.306	0.502	6.38	0.000
Efficiency of Technology Management	0.835	0.29	0.273	2.88	0.006
Industry Regulation	0.836	0.311	0.251	2.69	0.010
Interaction Term (Technology Deployment Strategies × Regulation)	-4.152	1.792	-0.192	-2.32	0.024

Source: Author

Step 1: Initial Regression Model (Main Effects).

In the first regression model, we examine how well the three independent variables—technology integration practices, scalability of technology deployment, and efficiency of technology management—explain variations in the performance of commercial banks in Kenya. The R^2 value of 0.662 indicates a strong model fit, meaning that 66.2% of the variance in bank performance can be explained by these three factors. This suggests that the chosen predictors are relatively effective in capturing the key drivers of performance in the banking sector, at least in the context of this sample.

Technology Integration Practices: The coefficient for technology integration practices is 0.514 with a p-value of 0.001, which is statistically significant at the 0.05 level. This indicates a strong positive relationship between the integration of technology (such as mobile banking, cloud computing, and digital payment systems) and bank performance. The Beta coefficient of 0.398 further supports this conclusion, showing that for every unit increase in technology integration, bank performance improves by 0.398 units. This suggests that banks that adopt newer and more advanced technologies are likely to experience improved profitability, higher operational efficiency, and better customer satisfaction. Therefore, effective technology integration is a crucial factor for enhancing competitive advantage and operational outcomes in the banking sector.

Scalability of Technology Deployment: The coefficient for scalability of technology deployment is 1.951, with a p-value of less than 0.000, indicating a highly significant and positive impact on bank performance. The Beta value of 0.502 implies that banks that successfully scale their technological solutions (such as expanding digital services, improving system capacity, and increasing technological reach) experience substantial improvements in performance. The ability to scale technology can enable banks to serve more customers, improve service delivery, and meet increasing demand, all of which lead to better financial performance and operational efficiency. The strong coefficient for scalability highlights its importance as a key driver of success in the modern banking sector, where the ability to adapt and grow with technological advancements is critical.

Efficiency of Technology Management: The coefficient for efficiency of technology management is 0.835 with a p-value of 0.006, which is statistically significant. This indicates that well-managed technology systems contribute positively to overall bank performance. The Beta coefficient of 0.273 suggests that improvements in technology management—such as system maintenance, timely updates, and effective resource allocation—translate to a moderate improvement in bank performance. Efficient management of technology can lead to cost savings, reduced downtime, and more reliable services, all of which enhance a bank's operational capacity and financial outcomes. Despite the moderate effect size, the statistical significance emphasizes how crucial good governance and management are when using technology to boost performance.

Step 2: Moderating Effect of Industry Regulation

In the second phase of the analysis, we look at how industry regulation affects the way technology deployment strategies and bank performance are related. With a p-value of 0.010 and an industry regulation coefficient of 0.836, it appears that regulatory factors have a positive impact on bank performance. Regulatory frameworks guarantee that banks uphold the necessary standards, preserve their financial stability, safeguard the interests of their clients, and promote systemic trust. These elements are necessary to maintain banks' long-term prosperity and good name. Although regulatory restrictions may appear onerous at first, they offer the framework required for safe and reliable operations, which ultimately improves the banking industry's overall performance. Thus, a well-organized regulatory framework is essential for success, especially when paired with the use of cutting-edge technologies.

Step 3: Testing the Interaction Term (Technology Deployment Strategies × Regulation)

In order to determine whether industry regulation moderates the impact of technology deployment strategies on bank performance, we introduce an interaction term in this step. The interaction term (regulation × technology deployment strategies) has a statistically significant coefficient of -4.152 and a p-value of 0.024. This negative coefficient shows that the performance-enhancing effects of technology deployment strategies decrease with increased regulation. Stated differently, the more stringent the regulatory environment, the less successful technology deployment strategies are at enhancing bank performance.

This moderation effect is moderate in size, according to the interaction term's beta value of -0.192. This indicates that performance outcomes are significantly impacted by the interaction between technology strategies and regulation, but not significantly. This finding suggests that banks may not be able to fully benefit from new technologies due to regulatory restrictions like compliance requirements, security measures, and reporting standards. Regulatory burdens can raise the cost of deploying scalable and effective tech solutions or slow down the adoption of new technological innovations. As a result, even though technology deployment strategies improve bank performance, regulatory frameworks occasionally prevent these benefits from being fully realized.

With p-values less than 0.05, the ANOVA results verify that both models—the first model with main effects and the second model with the interaction term—are highly

statistically significant. Both models account for a sizable amount of the variation in bank performance, as evidenced by the F-statistics for the original model (26.84) and the model with the interaction term (33.20). With the R2 value rising from 0.662 to 0.803 after the interaction term is added, the model fit is improved and it appears that the second model better explains the performance variations. Incorporating industry regulation and its relationship to technology deployment strategies improves the model's explanatory power, as evidenced by the improved R2 value. This underscores the significance of taking regulatory factors into account when analyzing the effects of technology on bank performance.

The analysis's findings highlight how important technology deployment tactics are to improving Kenyan commercial banks' performance. The results show that scalability, management efficiency, and technology integration all significantly improve bank performance. The moderating effect of industry regulation, however, shows that although regulation improves performance overall, it can also lessen the benefits of technology deployment tactics. According to this moderating effect, compliance requirements and other regulatory constraints may make it difficult for banks operating in highly regulated environments to fully capitalize on the potential advantages of technological innovations. Therefore, in order to maximize performance outcomes, Kenyan banks must carefully balance the need to adhere to industry regulations with their technological advancements.

5. DISCUSSION

Industry regulations do, in fact, significantly moderate the relationship between technology deployment strategies and Kenyan commercial banks' performance, according to the study's findings, which were sufficient to reject the null hypothesis (H04). With a p-value of 0.024 and a statistically significant negative coefficient of -4.152, the interaction term between industry regulations and technology deployment strategies fell below the significance level of 0.05. This implies that the beneficial effects of technology deployment on bank performance are considerably diminished by industry regulations. Furthermore, a moderate moderating effect is indicated by the standardized Beta value of -0.192, which highlights the part regulations play in influencing the relationship between technology deployment and performance.

Numerous studies that look at how regulatory frameworks affect technological innovation and organizational performance have focused on the moderating effect of industry regulations on technology deployment strategies. Elms and Low (2019), for instance, investigated how industry regulations affected the use of technology in the financial services sector. According to their research, the introduction and adoption of new technologies are frequently slowed down by strict industry regulations. They did point out, though, that financial institutions typically have better long-term results when their technology deployment strategies are in line with regulatory requirements. In addition to reducing regulatory risks, this strategic alignment improves operational effectiveness, stakeholder and customer confidence, and performance outcomes.

Similar to this, Kim (2020) investigated South Korea's fintech innovation and regulatory frameworks, concentrating on both established banks and fintech startups. Strict regulations may initially hinder the adoption of technology, but they ultimately foster a more stable and secure environment for fintech innovations, according to the research. According to the study, banks that actively interact with regulators and integrate regulatory modifications into their technology deployment plans typically see improvements in financial stability and customer satisfaction. This is consistent with the current study's findings, which indicate that although regulations may moderate the relationship between technology deployment and performance, they can also promote stability and better results if they are properly managed.

A long-term study on technology adoption in the insurance industry under regulatory restrictions was carried out by Gupta and Pal in 2021. According to their research, regulatory restrictions have a big impact on how quickly and widely technology is adopted. In addition to improving their operational performance, insurers who created flexible plans to adhere to changing regulations also obtained a competitive edge by strengthening their risk management capacities. Kenyan banks may find this study's emphasis on the value of regulatory environment adaptation helpful in navigating the intricate regulatory environment while pursuing technology-driven performance enhancements.

Johnson and Lewis (2022) investigated how regulatory agencies influence the use of technology in the healthcare industry, which lends more credence to this viewpoint. Their study made clear how important regulatory agencies are in regulating the connection between technology performance and deployment. Healthcare providers can reduce compliance risks and increase operational efficiency, which will ultimately result in improved performance, by making sure that regulatory standards are followed. This observation is pertinent to the banking industry in Kenya, where performance levels are maintained by strict adherence to regulatory requirements.

Last but not least, Wang and Zhou (2023) compared the technological practices and regulatory frameworks in the telecom sector. According to their findings, telecom companies perform better when they are subject to clear and encouraging regulations. On the other hand, unclear or unduly restrictive regulations impede technological advancement and lower performance. This supports the current study's findings and raises the possibility that Kenya's regulatory framework may moderate the efficacy of commercial banks' technology deployment plans in a comparable way.

In summary, the denial of H04 indicates that industry rules do, in fact, significantly moderate the association between Kenyan banks' performance and their technology deployment strategies. Regulations give institutions stability and structure, which makes it possible for them to adopt new technologies in a more controlled and secure way, even though they may slow down the rate of technological innovation. The benefits of technology deployment, however, can be diminished by unduly onerous or ambiguous regulations, highlighting the necessity of supportive and balanced regulatory frameworks that promote innovation while guaranteeing compliance and risk management. Therefore, in order to maximise the positive effects of technology deployment on their performance, Kenyan banks need to carefully navigate the regulatory environment.

6. CONCLUSIONS

The results of the moderated regression analysis show that the relationship between Kenyan commercial banks' performance and their technology deployment strategies is significantly moderated by industry regulations. With a statistically significant p-value of 0.024, the interaction term that combined industry regulation and technology deployment strategies yielded a negative coefficient of -4.152. This finding suggests that the beneficial effects of technology deployment strategies, like integration, scalability, and efficiency, on bank performance diminish as the regulatory burden rises. The moderate effect size is further supported by the beta value of -0.192, which indicates that regulations do not completely eliminate the advantages of technology but rather lessen their impact. These results support the idea that even though technology is a key factor in performance and innovation, regulatory frameworks—particularly those that are strict or complicated—can serve as bottlenecks by delaying the adoption, modification, or expansion of technological solutions.

The way banks handle technology investments in a regulated setting is significantly impacted by this moderating effect. Industry regulations may unintentionally impede technological advancement, even though they are crucial for maintaining cybersecurity, consumer protection, and the stability of the financial system. For example, in order to comply with regulatory standards, compliance protocols may require expensive system modifications, prolong implementation timelines, or limit the use of specific technologies (like cloud computing or artificial intelligence). As a result, banks that are subject to more stringent regulatory oversight may find it difficult to fully benefit from their technology strategies. Thus, the study emphasises how crucial it is to strike a balance between encouraging innovation and upholding efficient regulation. To create flexible compliance frameworks that encourage rather than hinder technological advancement, banks and regulators may need to work together more.

8. LIMITATIONS OF THE STUDY

This study has limitations even though it offers insightful information about how industry regulations moderate the relationship between Kenyan commercial banks' performance and their technology deployment strategies. First, because data were gathered at a single point in time, a cross-sectional research design restricts the capacity to infer causality. A longitudinal approach might be used in future studies to better understand trends and changes over time.

Second, the study used self-reported data from bank workers, which could be inaccurate due to respondent perceptions or social desirability bias. Despite efforts to maintain objectivity and confidentiality, these elements might have affected the answers. Furthermore, how these dynamics might vary among various bank types (e.g., large vs. small, public vs. private) was not examined in the study. To capture a wider range of viewpoints, future research should take into account comparative or stratified designs.

9. RECOMMENDATIONS

The study found that industry regulations significantly and negatively moderated the relationship between performance and technology deployment strategies. This emphasizes how important it is for banks and regulators to balance innovation and compliance. To promote more adaptable and innovation-friendly regulatory frameworks, commercial banks are advised to actively engage regulators through industry working groups, policy dialogues, and consultative forums. Without sacrificing the security and stability of the financial system, this cooperative approach can help guarantee that regulations are adaptable to new developments in technology.

Incorporating RegTech (regulatory technology) solutions that automate compliance procedures, track regulatory changes in real-time, and effectively generate necessary reports is another way that banks can improve their capacity for regulatory compliance. Banks can continue to pursue technological innovation while lowering the burden of compliance by utilising such technologies. Finally, regulators themselves ought to think about implementing a sandbox strategy, which would allow banks to test new technologies in safe settings without having to deal with the full weight of regulations. In addition to encouraging innovation, these programs will give regulators a better understanding of cutting-edge technologies, enabling them to create more intelligent and flexible regulations.

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