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Effect of Financial Technology on Financial Performance of Commercial Banks in Kenya

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Abstract

Performance in the financial markets is an essential component in the study of finance. Over the last decade, Kenya's commercial banks have increased their use of different types of financial technology (2011-2021). Mobile banking, agency banking, internet banking, and automated teller machines are just some of the various forms of financial technology available today. The purpose of this study was to evaluate the impact that financial technology has had, if any, on the overall financial performance of commercial banks in Kenya. The specific goals were to establish the effect of mobile banking on financial performance; to determine the effect of internet banking on financial performance; to determine the effect of agency banking on financial performance; to determine the effect of ATMs on financial performance; and to establish the moderating role of bank size on the relationship between financial technology and the financial performance of commercial banks. The research was predicated on the technological adoption model, the financial intermediation theory, the diffusion of innovation theory, and the profit maximization theory. The positivist research philosophy was used for this study, and a panel longitudinal research methodology was used for the research. The population of the study was the 38 commercial banks that have been in continuous operation throughout the last decade. The study was a census. Secondary information was gathered on an annual basis, and it covered a span of ten years (January 2012 to December 2021). The data was evaluated making use of descriptive statistics as well as inferential statistics entailing correlation and panel multiple linear regression analysis. The current research conclusions revealed that financial technology fairly explains financial performance and the current research discoveries also revealed that the financial technology is sufficient in predicting financial performance. Additional study findings were that mobile banking, internet banking, agency banking, adoption of ATMs, and bank size had positive significant correlations with financial performance. Moreover, findings were that adoption of ATMs had a significant negative link with financial performance. Meanwhile, mobile banking and agency banking had negative insignificant link with financial performance. Finally, both internet banking and bank size had a positive insignificant relationship with financial performance. Policy recommendations to the government officials and policy formulators in the Treasury and the CBK to not mainly advocate for financial technology policy as a means of boosting bank financial performance and it is recommended to the policy makers to utilize other policies when aiming to boost bank financial performance. Recommendations are also generated to the bank management and consultants not to mainly consider financial technology will significantly boost the banks' financial performance.

Keywords: *Financial Technology, Financial Performance, ATM, Mobile banking, Internet banking, Agency Banking*

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1.0 Background of the Study

The financial success of a commercial entity carries with it the desire to grow as a means of reaching even higher financial performance within a certain amount of time (Tomal & Jones, 2015). The current market climate is characterized by volatility, uncertainty, complexity, and ambiguity; as a result, firms are finding it difficult to accurately anticipate their future. Ambiguity and complexity are also factors (Baba & Nasieku, 2016). The political climate, technology landscape, social landscape, and legal landscape are only few of the anticipated contributors to the ever-changing character of the corporate environment. This is because these factors are expected to have a role in the future expansion of the corporate environment. Because of these changes, companies are becoming concerned about their ability to remain stable and sustainable in their performance. As a result, businesses are realizing that they need to develop strategies in order to continue maintaining their competitive capacity and continue being successful in an environment that is undergoing such significant transformation (Baei, Ahmadi, Sharifi, Malafeh, &Baee, 2017).

Over the course of many decades, the international banking industry has been subjected to significant evolution (Nejad, 2016). Since a number of years ago, financial technology has been one of the most important aspects of economic activity. Private investors in ancient Rome, which is located in central Italy, created numerous aspects of limited liability organizations. Stocks could be bought and sold openly on an exchange, and businesses were legally distinct from their shareholders (Zhang, 2017). Entrepreneurs in the mining technology and financial sectors profited from the release of capital for innovation, which resulted in the creation of specialized investment banks, new financial instruments, and improved accounting systems (Hsiao & Lin, 2017). The availability of financial services to consumers has been profoundly altered by the proliferation of information and communication technologies (Hussien & Aziz, 2017).

Any innovation in technology that improves the efficiency of the financial sector is considered part of financial technology (Sheleg & Kohali, 2015). Financial Technology is providing a wide range of technology solutions to improve efficiency, speed of reaction, and customer satisfaction (Klapper, 2016). The financial industry is comprised of a wide variety of stakeholders, many of whom have been susceptible to being influenced by financial technologies. As a consequence, asset management services have improved, with the ability to provide wealth management to retail consumers through streamlined systems, proposals of algorithms to help the decision-making process, and artificial intelligence management of portfolios via robots. The value of asset management as a whole has risen as a consequence. The banking industry has also been impacted by the rise of mobile banking, the use of distributed ledger technology to facilitate faster transactions, the proliferation of cryptocurrencies, the proliferation of mobile lending to individuals and small market enterprises, and the use of data analytics to better understand consumers' saving habits, credit histories, spending habits, and tax obligations (Yang & Liu, 2016).

In Kenya's banking industry, technological advancements in the financial sphere are continuing to drive development and impact the industry. The Kenyan banking industry has placed an increased emphasis on financial technology as a strategic weapon to attain the organization aim of lowering costs while simultaneously growing revenues. Equity has been utilizing Equitel and Eazzy banking apps, KCB has been advertising KCB MPESA, and fuliza was just adopted by KCB. NCBA bank has been offering Mshwari. Via their digital platforms, other banks also offer some type of mobile lending (CBK, 2020). The key question is whether the adoption of financial technologies has enhanced financial performance.

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The Kenyan Banking industry is the most competitive in the East African region, according to a survey by the IMF (Sittoni, 2018). Regulatory developments have occurred in recent years, including as the establishment of interest rate caps in September 2016, followed by their repeal in November 2019; The implementation of the ninth version of the International Financial Reporting Standard (IFRS), which was released to the public in January of 2018; Over the course of the last several years, a number of Kenyan banks have merged with either other domestic or international financial institutions, resulting in the formation of larger enterprises that are in a strong position to compete on both the local and international fronts. Several banks are also migrating from the old brick and mortar to more sophisticated and accessible banking channels in the technological world; bank consumers have grown more financially wealthy and knowledgeable. Banks are feeling the pressure of operating a business because of the rising level of competition in the banking market. Therefore, in order to react to competition, Kenyan banks need to create tactics such as financial technology. This would allow them to both protect their existing niches and grow their overall market share (Kibicho, 2015).

There has been a large amount of difference in the financial performance of commercial banks, with some commercial banks, such as KCB, Equity, Standard Chartered Bank, and Cooperative bank, exhibiting an increase in ROA while other commercial banks, such as other commercial banks, exhibiting a decrease in ROA. In recent times, we have seen a number of financial institutions, such as Chase bank and Imperial bank, being placed under receivership, while other financial institutions, such as National bank, have been acquired by other financial organizations. In addition, mergers have been seen between rival banks, such as NCBA, all in an attempt to preserve the market's financial stability, and these mergers have taken place as a consequence of this endeavour (CBK, 2020). In light of this, it is abundantly clear that study into the effects that financial technology has on financial performance is essential, as are legislative measures to protect the money of stakeholders and the institutions that hold it from unnecessary risk. Table 1 presents, for the years 2017 through 2021, an average of the financial performance of commercial banks in Kenya.

Table 1: Average Financial Performance of Commercial Banks

	2017	2018	2019	2020	2021
ROA	2.7	2.6	2.6	1.7	2.5

Source: CBK (2022)

1.2 Statement of the Problem

For the last five years, Kenya's commercial banks' financial results have been erratic. The banks reported a decline in ROA in 2018 from 2.7% to 2.6%. The ROA in 2019 was also 2.6% but this fall lower in 2020 to stand at 1.7%. The ROA however rose in 2021 to stand at 2.5%. In addition, a number of Kenya's commercial banks, including Chase Bank and Imperial Bank, have been forced to discontinue business operations due to difficulties with their financial performance (CBK, 2021). However, despite all of this increased digitization, certain banks, such as National Bank, Sidian Bank, and Victoria Bank, have shown a drop in financial performance. These banks' goals were to improve their financial performance, compete favorably with their peers, reduce personnel costs, and improve their network base. In addition to the rivalry for clients that exists amongst commercial banks in Kenya, these banks are now experiencing competition for the same consumers from a rise in the number of digital lenders operating in the Kenyan market (Koki, 2018).

Bochaberi and Job (2021), Jagathi (2021), Njoroge (2021), Mutinda (2018), Kamande (2018), Sujud and Hashem (2017), and Kariu (2017), among others, have published studies with varying conclusions on the impact of financial technology on banks' bottom lines (2017). Mobile banking, according to Mutinda (2018) research, has a considerable negative influence on Kenya's publicly listed commercial banks' profitability. There is an issue with this research since it doesn't include agency banking as an example of financial technology. Commercial banks' experiences with mobile banking were the focus of Bochaberi and Job's investigation in 2021. The study's small sample size (four commercial banks) raises methodological questions regarding its applicability to a larger population. Although the findings of Njoroge (2021) study indicated a link between agency banking and financial deepening, the researcher opted to dismiss agency banking influence on financial performance, which resulted in a lack of comprehension of this theory. For obvious reasons, the research conducted by Jagathi (2021) comparing Indian bank profitability and the number of ATMs in operation differs greatly from a study done in Kenya, which is very similar to Jagathi's research. This is due to the vastly different economic and social structures in the two countries.

Despite the fact that there are past studies in this field, there are still study gaps. To begin, most regional studies have used narrow definitions of financial technology, albeit there is considerable variation across these approaches. This line of inquiry was undertaken with the intention of closing the ensuing conceptual holes. Previous regional studies had methodological flaws as well; they were only conducted over relatively short periods of time (five years), which may not have been long enough to fully reflect the impact that financial technology possess on financial performance. Previous regional studies had methodological flaws as well. In the course of this investigation, a time range of ten years will be used. In addition, the vast majority of the earlier regional studies focused on primary data in order to capture the connection between financial technology and the financial performance of banks. On the other hand, the present research will rely on secondary data, which is generally acknowledged to be more objective.

1.3 Research Objectives

i. To determine the effect of mobile banking on the financial performance of commercial banks in Kenya
ii. To establish the effect of internet banking on the financial performance of commercial banks in Kenya
iii. To assess the effect of agency banking on the financial performance of commercial banks in Kenya
iv. To determine the effect of ATMs on the financial performance of commercial banks in Kenya.
v. To establish the moderating effect of bank size on the relationship between financial technology and financial performance of commercial banks in Kenya

1.4 Research Hypotheses

H_{01}: Mobile banking has no significant effect on the financial performance of commercial banks in Kenya

H_{02}: Internet banking has no significant effect on the financial performance of commercial banks in Kenya

H_{03}: Agency banking has no significant effect on the financial performance of commercial banks in Kenya

H_{04}: ATMs have no significant effect on the financial performance of commercial banks in Kenya

H_{05}: Bank size has no significant moderating effect on the relationship between financial technology and financial performance of commercial banks in Kenya.

2.0 LITERATURE REVIEW

Bochaberi and Job (2021) were interested in determining how its use has impacted the bottom lines of commercial banks in Kenya. The researcher relied on a descriptive approach for the technique of investigation. According to the conclusions of the study, the introduction of mobile banking has had an effect on each of the four most significant commercial banks in Kenya. Four commercial banks were the only ones studied; additional extensive studies including other types of financial institutions are required. An investigation by Ocharo and Muturi (2016) into the effect of alternative banking channels on the financial performance of banks in Kisii County found a positive correlation between the financial performance of banks and their use of alternative banking methods like mobile banking, ATMs, the internet, or agency banks. This research relies only on primary sources of data. The present investigation made use of secondary data, which is often seen as being more objective.

Hossain (2021) conducts research on the effect that the use of e-banking technology in Bangladesh's state-owned commercial banks has had on the profitability of those institutions. For the purpose of conducting an analysis of the panel data that was acquired from the sample banks, a pooled ordinary least square (OLS) estimate was used. Studies have shown that in the first year after an institution implements electronic banking, the practice has a considerable negative impact on the ROA, ROE, and net interest margin of the institution. However, the studies suggest that one year after using electronic banking, ROI improves significantly. Kinyua (2018) set out to examine how the rise of internet banking has altered bank efficiency in Kenya. The findings of the study demonstrated that every criterion under consideration possessed statistically significant value. According to this study, positive values were produced by Internet banking as well as liquidity, whereas negative values were produced by bank size. The study found no significant connection between the amount of capital available at commercial banks and their overall efficiency.

Njoroge (2021) investigated the impact that agency banking had on the development of the Kenyan financial industry and came to the conclusion that it was beneficial. A descriptive study approach was used. According to the conclusions of the study, the growth of Kenya's financial system was significantly impacted by three factors: the number of agents, the volume of agency banking transactions, and the value of agency banking transactions. This study distinguished financial deepening as a separate concept from financial performance, the latter of which would be the subject of the next study. King'ang'ai et al. (2016) examined data from a subset of Rwanda's four commercial banks to determine the impact of agents on the financial performance of Rwandan banks as of December 31, 2015. According to the findings of a multiple linear regression study, agency banking has resulted in a significant and positively impactful outcome for commercial banks in Rwanda. Only primary sources of information were used for this investigation. The present investigation made use of secondary data, which is often seen as being more objective.

Sindani, Muturi, and Ngumi (2019) examined the correlation between the growth of financial distribution channels and the rate of financial inclusion in Kenya during a six-year period, from 2012 to 2017. In particular, to examine the ways in which the growing popularity of online banking and automated teller machine use in Kenya have contributed to that country's increasingly high rate of financial inclusion. This study's results suggest that internet banking

in Kenya benefits the financial sector as a whole by increasing productivity and efficiency. In addition, the introduction of ATM banking has helped increase financial inclusion in Kenya.

Ogweno (2019) sought to examine the potential impact of fintech adoption on the bottom lines of Kenya's supervised MFIs. As of December 31st, 2018, the sample population for this study included 13 MFIs that had been granted licenses. According to the findings of the research conducted, factors such as agency banking, the accessibility of ATMs, and enough capital do not have a major impact on the financial success of regulated MFIs. This research concentrated on MFIs since their business models are distinct from those of commercial banks, which are the primary topic of another study now being conducted.

Pagano (2018) assessed the link between firm size distribution and profitability in European Countries. The study examined the industry level and size structure. Panel data was used for fifteen years. An exploratory research design was used, and a positive and robust relationship was established between the average size of a firm and its profitability. The results indicate that larger size fosters productivity and firm profitability. In examining the connection between financial technology and bank performance, the impact of bank size was not taken into account. The impact of business size was investigated in the present investigation.

Mwangi (2016) tested the firm size contribution on microfinance banks profitability in Kenya. A census survey was conducted involving a total of 9 microfinance banks. This study was covered in duration between 2011 and 2015 (5 years). A regression equation was chosen to find out the nexus between firm size and profitability. Profitability of Kenya's microfinance institutions was shown to be significantly affected both by firm size and operational efficiency. No attempt was made to control the impact of bank size on the correlation between financial technology and profitability. Firm size is a moderating factor that was examined in the present investigation.

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2.1 Conceptual Framework

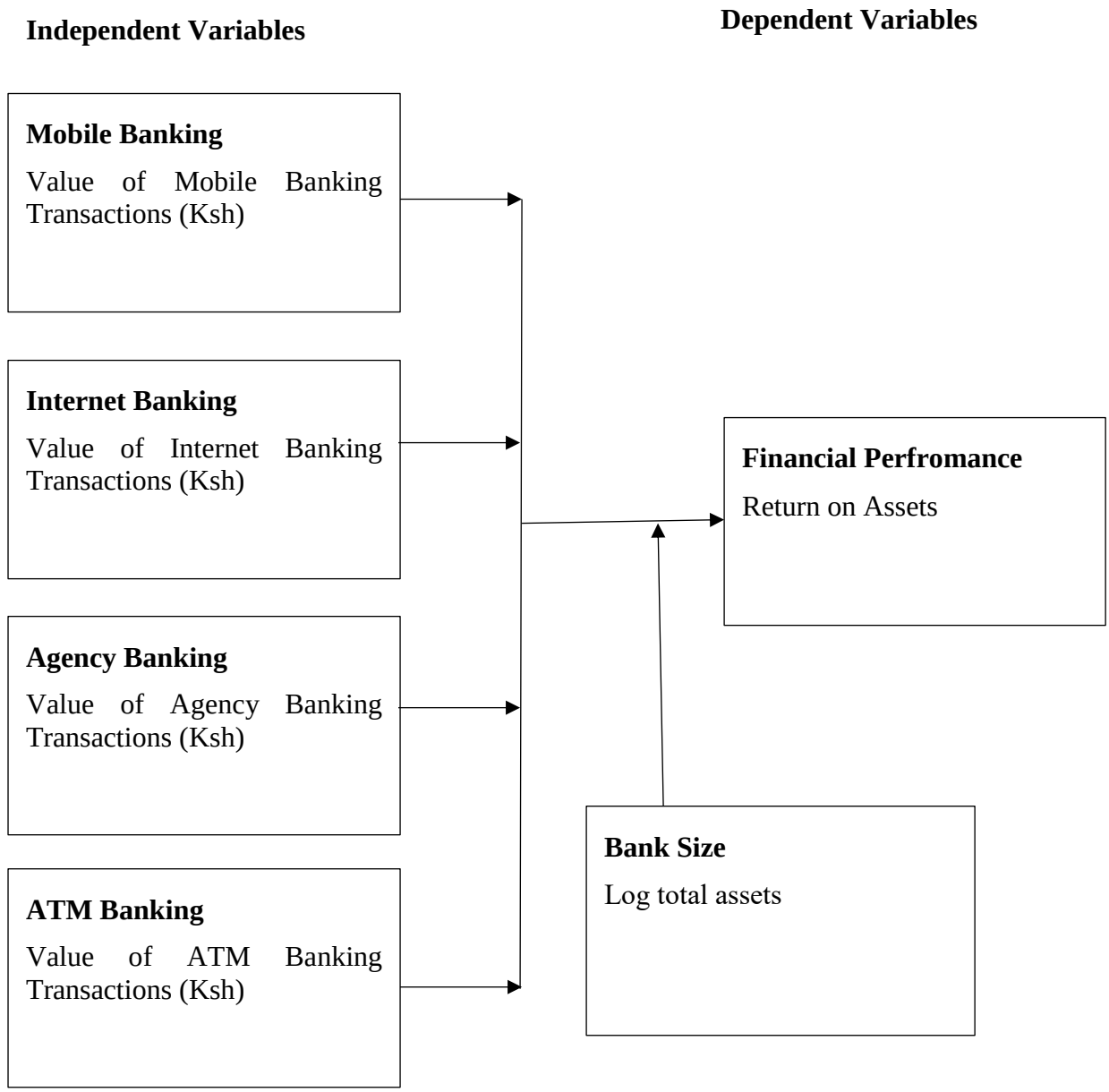

Figure 2.1: Conceptual Model

Source: Researcher (2022)

3.0 RESEARCH METHODOLOGY

The positivist philosophical approach was taken in this investigation due to the fact that the variables of interest are objective, external, and independent of the researcher. A longitudinal panel study methodology was used for this investigation. Since both financial technology and financial performance evolve over time, a longitudinal study was the most appropriate method for this investigation. Therefore, this approach permits the collecting of data on the same research variables repeatedly over a lengthy time span, allowing for the establishment of trend and connection. All 38 commercial banks in Kenya that have been running their businesses without interruption for the last decade made up the study's population. This research used a census sampling strategy, in which each and every business that falls within the purview of the

target demographic was included in the evaluation process. The commercial banks in Kenya are required by law to get the secondary data from the CBK. Because doing so is necessary to satisfy the requirements set out by the regulatory body. A decade's worth of data will be gathered annually (January 2012 to December 2021). The presentation of the findings included the use of table-based representations of percentages, frequencies, measures of central trends, and measures of dispersion. The Pearson correlation, panel regressions, analysis of variance (ANOVA), and coefficient of determination were all be included in the inferential statistics. The study conducted some diagnostic tests that included normality test, multicollinearity test, heteroscedasticity test, autocorrelation test, stationarity test and test for random or fixed effect.

4.0 RESEARCH FINDINGS AND DISCUSSIONS

4.1 Descriptive Statistics

A descriptive study attempts to explain or characterize a subject by outlining a number of issues, people, or events, gathering data, and tabulating the frequency of research variables or their relationship. The descriptive research strategy was chosen for the current research since it will allow for the generalization of population findings as well as the analysis and correlation of variables. Measures of central tendency were included in the descriptive analysis, including the mean, standard deviation, the median, and the mode. Dispersion measures like the lowest and maximum statistic and range were used. Additionally, symmetry metrics like Kurtosis and Skewness were used.

Table 4.1: ROA Descriptive Statistics

	Percentiles	**Smallest**		
1%	-0.0593	-0.075		
5%	-0.0193	-0.0697		
10%	-0.0031	-0.0613	Obs	362
25%	0.01	-0.0593	Sum of Wgt.	362
50%	0.029477		Mean	0.025363
		Largest	Std. Dev.	0.025133
75%	0.0414	0.0794		
90%	0.054192	0.0799	Variance	0.000632
95%	0.0593	0.083322	Skewness	-0.72716
99%	0.0794	0.0844	Kurtosis	4.310189

Conclusions in Table 4.1 show that the highest value for ROA of the commercial banks is 8.44% and the least value is -7.5%. The mean was 2.54% and standard deviation depicts variability value in ROA of ±2.51%. The other measures of central tendency, which entailed the median, was 2.95%. The variance was 0.0632%. The data in the series is normally distributed since it has a skewness statistic that lies in the range of -0.8 to +0.8 even though it has a kurtosis statistic lying marginally outside the range of -3 to +3.

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Table 4.2: Value of Mobile Banking Descriptive Statistics

	Percentiles	Smallest		
1%	15,136	13,917		
5%	29,989	14,313		
10%	37,128	14,717	Obs	362
25%	96,386	15,136	Sum of Wgt.	362
50%	601,200		Mean	32,900,000
		Largest	Std. Dev.	66,000,000
75%	25,000,000	298,000,000		
90%	135,000,000	304,000,000	Variance	$4.36*10^{15}$
95%	193,000,000	310,000,000	Skewness	2.1432
99%	298,000,000	314,000,000	Kurtosis	6.9433

Findings in Table 4.2 display that the highest value for value of mobile banking transactions of the commercial banks was KES 314 billion and the lowest value was KES 13.92 million. The mean was KES 32.9 billion and the value of the standard deviation depicts variability in value of mobile banking transactions of ± KES 66 billion. The other measures of central tendency, which entailed the median, was KES 601.2 million. The variance was KES 4,360,000,000 billion. The data in the series is not normally distributed because it has a kurtosis statistic not lying within the range of -3 to +3 and a skewness statistic lying out of range of -0.8 to +0.8.

Table 4.3: Value of Internet Banking Descriptive Statistics

	Percentiles	Smallest		
1%	41,167	23,540		
5%	58,597	32,508		
10%	81,766	41,053	Obs	362
25%	122,473	41,167	Sum of Wgt.	362
50%	222,864		Mean	10,600,000
		Largest	Std. Dev.	20,200,000
75%	11,500,000	87,700,000		
90%	44,500,000	89,000,000	Variance	4.09E+14
95%	57,600,000	90,900,000	Skewness	1.9432
99%	87,700,000	92,200,000	Kurtosis	5.9275

Findings in Table 4.3 showcase that the highest value for value of internet banking transactions of the commercial banks was KES 92.2 billion and the lowest value was KES 23.54 million. The mean was KES 10.6 billion and the value of the standard deviation depicts variability in value of internet banking transactions of ± KES 20.2 billion. The other measure of central tendency, which entailed the median, was KES 222.864 million. The variance was KES 409,000,000 billion. The data in the series is not normally distributed because it has a kurtosis statistic not lying within the range of -3 to +3 and a skewness statistic lying out of range of -0.8 to +0.8.

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Table 4.4: Value of Agency Banking Descriptive Statistics

	Percentiles	Smallest		
1%	986	918		
5%	4,144	938		
10%	6,445	965	**Obs**	362
25%	94,077	986	**Sum of Wgt.**	362
50%	339,182		**Mean**	14,300,000
		Largest	**Std. Dev.**	49,800,000
75%	1,499,861	349,000,000		
90%	34,700,000	358,000,000	**Variance**	2.48E+15
95%	86,100,000	363,000,000	**Skewness**	5.19775
99%	349,000,000	368,000,000	**Kurtosis**	32.72145

Findings in Table 4.4 showcase that the highest value for value of agency banking transactions of the commercial banks was KES 368 billion and the lowest value was KES 918,000. The mean was KES 14.3 billion and the value of the standard deviation depicts variability in value of agency banking transactions of ± KES 49.8 billion. The other measure of central tendency, which entailed the median, was KES 339.182 million. The variance was KES 2,480,000,000 billion. The data in the series is not normally distributed because it has a kurtosis statistic not lying within the range of -3 to +3 and a skewness statistic lying out of range of -0.8 to +0.8.

Table 4.5: Value of ATM Transactions Descriptive Statistics

	Percentiles	Smallest		
1%	36,278	33,581		
5%	47,654	35,203		
10%	76,095	35,731	**Obs**	362
25%	97,972	36,278	**Sum of Wgt**	362
50%	201,622		**Mean**	1,259,874
		Largest	**Std. Dev.**	2,376,360
75%	1,946,655	6,520,427		
90%	3,914,917	6,754,069	**Variance**	5.65E+12
95%	4,508,770	23,900,000	**Skewness**	5.7707
99%	6,520,427	25,500,000	**Kurtosis**	54.1428

Findings in Table 4.5 display that the highest value for value of ATM transactions of the commercial banks was KES 25.5 billion and the lowest value was KES 33.58 million. The mean was KES 1.26 billion and the value of the standard deviation depicts variability in value of ATM transactions of ± KES 2.38 billion. The other measure of central tendency, which entailed the median, was KES 201.62 million. The variance was KES 5,650,000 billion. The data in the series is not normally distributed because it has a kurtosis statistic not lying within the range of -3 to +3 and a skewness statistic lying out of range of -0.8 to +0.8.

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Table 4.6: Firm Size Descriptive Statistics

	Percentiles	Smallest		
1%	1,783,432	232,959		
5%	5,823,567	251,261		
10%	9,745,125	271,000	**Obs**	362
25%	14,500,000	1,783,432	**Sum of Wgt.**	362
50%	31,000,000		**Mean**	115,000,000
		Largest	**Std. Dev.**	185,000,000
75%	123,000,000	987,000,000		
90%	335,000,000	1,070,000,000	**Variance**	3.41E+16
95%	472,000,000	1,210,000,000	**Skewness**	2.9491
99%	987,000,000	1,270,000,000	**Kurtosis**	14.0484

Findings in Table 4.6 reveal that the highest value for value of total assets of the commercial banks was KES 1.27 trillion and the lowest value was KES 232.96 million. The mean was KES 115 billion and the value of the standard deviation depicts variability in total assets of ± KES 185 billion. The other measure of central tendency, which entailed the median, was KES 31 billion. The variance was KES 34,100,000,000 billion. The data in the series is not normally distributed because it has a kurtosis statistic not lying within the range of -3 to +3 and a skewness statistic lying out of range of -0.8 to +0.8.

4.2 Diagnostic Tests

The best linear unbiased estimators were tested prior to undertaking linear regression (BLUE). This research used normality, homoscedasticity, multiple-collinearity, and autocorrelation tests. The Shapiro-Wilk test was employed to assess normality of data employed in the study. The Breusch-Pagan test for homoscedasticity was employed to determine whether the independent variables employed in the study have constant variance, while in order to establish multi-collinearity, Variance Inflation Factors (VIF) statistics were adopted. The Durbin-Watson d statistic was utilized in the study to test for autocorrelation. Panel regression of fixed or variable effects was tested using Hausman tests, while unit root tests were done using Fisher's type unit roots.

4.2.1 Normality Test

Table 4.7 emphasizes testing of normal distribution for the study variables.

Table 4.7: Normality Test

Variable	Obs	W	V	z	Prob>z
ROA	362	0.96875	7.868	4.886	0.0000
MobileBank~g	362	0.87666	31.056	8.137	0.0000
InternetBa~g	362	0.77837	55.805	9.525	0.0000
AgencyBank~g	362	0.96552	8.683	5.119	0.0000
ATMs	362	0.88706	28.437	7.929	0.0000
BankSize	362	0.96348	9.196	5.255	0.0000

The significance values of all the variables utilized in the study in the Shapiro-Wilk test of normality are less than α (0.05), as shown in Table 4.1. Thus, the variables' data series are not normally distributed. Standardization is a remedy for non-normal distribution of data, thus, all variable data series were standardized to address non-normal distribution.

4.2.2 Homoscedasticity Test

Table 4.8 includes homoscedasticity tests of every independent variable used in the research. The test is used to establish if all the predictor variables have a constant variance.

Table 4.8: Breusch-Pagan/Cook-Weisberg Test for Heteroscedasticity

Ho: Constant variance
Variables: fitted values of ROA
chi2(1) = 6.27
Prob > chi2 = 0.0123

The null hypothesis is that the data employed in the study displays homoscedasticity, while the alternate hypothesis is that the data employed in the study displays heteroscedasticity. The study analysis found that (Prob > chi2= 0.0018) is below the study critical value of (α=0.05), so the null hypothesis is rejected. Thus, the study's predictor variable data series are all heteroscedastic. Robust standard errors are a remedy for heteroscedasticity. Thus, robust standard errors were applied to correct heteroscedasticity.

4.2.3 Test for Multicollinearity

Multicollinearity is tested using Variance Inflation Factors as displayed in Table 4.9.

Table 4.9: VIF Multicollinearity Statistics

Variable	VIF	1/VIF
InternetBa~g	16.88	0.059252
MobileBank~g	13.72	0.07289
ATMs	3.8	0.263121
BankSize	3.09	0.323193
AgencyBank~g	3.06	0.326877
Mean VIF	8.11	

The rule of thumb is that the VIF values ought to be more than 1 and less than 10 in order to ascertain lack of multicollinearity. Table 4.9 reveals that all independent and control variables utilized in the current study, apart from internet banking and mobile banking, have VIF values greater than 1 but less than 10. This indicates that the variables do not exhibit multicollinearity. However, the variables internet banking and mobile banking exhibit multicollinearity. Standardization is a remedy for multicollinearity. Thus, the variables internet banking and mobile banking were standardized to cater for multicollinearity.

4.2.4 Tests for Autocorrelation

The Durbin Watson d-statistic was applied in testing for autocorrelation. The Durbin Watson d-statistic normally varies from 0 to 4. In the absence of autocorrelation, the value 2 is obtained. Positive autocorrelation is indicated by a Durbin Watson score of 0 to 2, whereas negative autocorrelation is indicated by a score of 2 to 4. A Durbin-Watson statistic of 1.5 to 2.5 is deemed normal, but as per Shenoy and Sharma (2015) anything other is grounds for concern. Though, Field (2009) established that a Durbin Watson d-statistic that is greater than 3 and lesser than 1 is a show for concern. The Durbin Watson d-statistic obtained for the current study is (6, 362) = 1.131903. Thus, the Durbin Watson d-statistic obtained for the current study meets the criteria set by Field (2009). Thus, there is no serial autocorrelation inherent in the current study variables.

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4.2.5 Unit Root Test

Table 4.10 presents the unit root test results, that was performed on the data series ROA.

Table 4.10: Unit Root Test for ROA

Fisher-type unit-root test for ROA				
Based on augmented Dickey-Fuller tests				
Ho: All panels contain unit roots			Number of panels =	38
Ha: At least one panel is stationary			Avg. number of periods =	9.53
AR parameter: Panel-specific			Asymptotics: T -> Infinity	
Panel means: Included				
Time trend: Not included				
Drift term: Not included			ADF regressions: 0 lags	
		Statistic	p-value	
Inverse chi-squared(76)	P	141.9503	0.00000	
Inverse normal	Z	-3.7647	0.00010	
Inverse logit t(189)	L*	-4.1947	0.00000	
Modified inv. chi-squared	Pm	5.3493	0.00000	

The null hypothesis states that ROA has unit root whereas the alternate hypothesis states that ROA is stationary. All the P, Z, L*, and Pm values are less than the α (0.05), thus the data series is stationary. The null hypothesis is rejected since the significant values obtained in Table 4.10 are below the research critical value (α=0.05).

Table 4.11 displays unit root test results on the mobile banking variable. The null hypothesis states that mobile banking has unit root whereas the alternate hypothesis states that mobile banking is stationary. All the P, Z, L*, and Pm values are less than the α (0.05), thus the data series is stationary. The null hypothesis is rejected since the significant values obtained in Table 4.11 are below the research (α=0.05) critical value.

Table 4.11: Unit Root Test for Mobile Banking

Fisher-type unit-root test for MobileBanking				
Based on augmented Dickey-Fuller tests				
Ho: All panels contain unit roots			Number of panels =	38
Ha: At least one panel is stationary			Avg. number of periods =	9.53
AR parameter: Panel-specific			Asymptotics: T -> Infinity	
Panel means: Included				
Time trend: Not included				
Drift term: Not included			ADF regressions: 0 lags	
		Statistic	p-value	
Inverse chi-squared(76)	P	175.5374	0.0000	
Inverse normal	Z	-4.0151	0.0000	
Inverse logit t(189)	L*	-5.5739	0.0000	
Modified inv. chi-squared	Pm	8.0736	0.0000	

Table 4.12 exhibits the findings of the unit root test done on the internet banking variable.

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Table 4.12: Unit Root Test for Internet Banking

Fisher-type unit-root test for InternetBanking			
Based on augmented Dickey-Fuller tests			
Ho: All panels contain unit roots		Number of panels =	38
Ha: At least one panel is stationary		Avg. number of periods =	9.53
AR parameter: Panel-specific		Asymptotics: T -> Infinity	
Panel means: Included			
Time trend: Not included			
Drift term: Not included		ADF regressions: 0 lags	
		Statistic	p-value
Inverse chi-squared(76)	P	76.7336	0.4549
Inverse normal	Z	-0.4636	0.3215
Inverse logit t(189)	L*	-0.7306	0.2330
Modified inv. chi-squared	Pm	0.0595	0.4763

The null hypothesis states that internet banking has unit root whereas the alternate hypothesis states that internet banking is stationary. All the P, Z, L*, and Pm values are greater than the α (0.05), thus the data series has unit root. The null hypothesis is not rejected since the significant values obtained in Table 4.12 are above the research (α=0.05) critical value. First differencing is a remedy for unit root. Thus, the internet banking variable will be first differenced as a remedy for unit root.

Table 4.13 contains the unit root test results on the internet banking variable.

Table 4.13: Unit Root Test for Agency Banking

Fisher-type unit-root test for AgencyBanking			
Based on augmented Dickey-Fuller tests			
Ho: All panels contain unit roots		Number of panels =	38
Ha: At least one panel is stationary		Avg. number of periods =	9.53
AR parameter: Panel-specific		Asymptotics: T -> Infinity	
Panel means: Included			
Time trend: Not included			
Drift term: Not included		ADF regressions: 0 lags	
Statistic	p-value		
Inverse chi-squared(76)	P	144.8494	0.0000
Inverse normal	Z	-1.6357	0.0510
Inverse logit t(189)	L*	-3.6901	0.0001
Modified inv. chi-squared	Pm	5.5844	0.0000

The null hypothesis states that agency banking has unit root whereas the alternate hypothesis states that mobile banking is stationary. The P, L*, and Pm values are less the α (0.05). However, the Z value lies marginally above the α (0.05). Since the majority of the values are less than the α (0.05), we can concluding that data series is stationary by rejecting the null hypothesis.

Table 4.14 contains the unit root test results on the ATM variable.

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Table 4.14: Unit Root Test for ATM

Fisher-type unit-root test for ATMs				
Based on augmented Dickey-Fuller tests				
Ho: All panels contain unit roots			Number of panels =	38
Ha: At least one panel is stationary			Avg. number of periods =	9.53
AR parameter: Panel-specific			Asymptotics: T -> Infinity	
Panel means: Included				
Time trend: Not included				
Drift term: Not included			ADF regressions: 0 lags	
		Statistic		p-value
Inverse chi-squared(76)	P	35.0703		1.00000
Inverse normal	Z	4.4573		1.00000
Inverse logit t(189)	L*	3.9847		1.00000
Modified inv. chi-squared	Pm	-3.3198		0.9995

The null hypothesis states that ATM has unit root whereas the alternate hypothesis states that ATM is stationary. All the P, Z, L*, and Pm values are greater than the α (0.05), thus the data series has unit root. The null hypothesis is not rejected since the significant values obtained in Table 4.14 are more than the research (α=0.05) critical value. First differencing is a remedy for unit root. Thus, the ATM variable will be first differenced as a remedy for unit root.

Table 4.15 contains the unit root test results on the bank size variable. The null hypothesis states that bank size has unit root whereas the alternate hypothesis states that bank size is stationary. All the P, Z, L*, and Pm values are greater than the α (0.05), thus the data series has unit root. The null hypothesis is not rejected since the significant values obtained in Table 4.15 are greater than the research (α=0.05) critical value. First differencing is a remedy for unit root. Thus, the bank size variable will be first differenced as a remedy for unit root.

Table 4.15: Unit Root Test for Bank Size

Fisher-type unit-root test for BankSize				
Based on augmented Dickey-Fuller tests				
Ho: All panels contain unit roots			Number of panels =	38
Ha: At least one panel is stationary			Avg. number of periods =	9.53
AR parameter: Panel-specific			Asymptotics: T -> Infinity	
Panel means: Included				
Time trend: Not included				
Drift term: Not included			ADF regressions: 0 lags	
		Statistic		p-value
Inverse chi-squared(76)	P	52.5948		0.9814
Inverse normal	Z	4.8256		1.0000
Inverse logit t(189)	L*	4.8390		1.0000
Modified inv. chi-squared	Pm	-1.8984		0.9712

4.2.6 Test for Random and Fixed Effects

The research used the Hausman test to determine if the factors had a fixed influence or a random and changing effect over time. The variables had to be changed before the Hausman test could be run since the conditions for normality, homoscedasticity, multicollinearity, and stationarity were not satisfied. Since none of the variables utilized met the requirement for normality, the normalcy was corrected by standardizing the variables. Due to the numerous predictors utilized

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in the study that demonstrated heteroscedasticity, the "robust standard errors" approach was used to detect unbiased standard errors in Ordinary Least Squares (OLS) coefficients during heteroscedasticity.

Since the mobile banking and internet banking exhibited multicollinearity, they were thus standardized as a remedy for multicollinearity. Finally, since the internet banking, ATM, and bank size variables exhibited unit root, they were thus first differenced as a remedy for unit root. The results of the Hausman test of specification are presented in Table 4.11 below.

Table 4.16: Hausman Test of Specification

	---- Coefficients ----			
	(b) fe	**(B) re**	**(b-B) Difference**	**sqrt(diag(V_b-V_B)) S.E.**
MobileBank~g	-0.002604	-0.00069	-0.00192	0.005029
InternetBa~g	-0.005143	0.001754	-0.0069	0.004638
AgencyBank~g	-0.002902	-0.00129	-0.00161	0.002029
ATMs	0.0052912	0.005774	-0.00048	0.004322
BankSize	0.0000371	0.00177	-0.00173	0.00183

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 25.93

Prob>chi2 = 0.0001

In this null hypothesis test was that the variables possess random effect while the variables have fixed effect was the alternate hypothesis. The null hypothesis would be rejected if the significance value obtained is below the critical value (α) of 0.05 whereas on the hand, it would not be rejected when the significance value obtained is greater the critical value (α) of 0.05. If the statistics of the Hausman chi-square tests are negative the alternative hypothesis is adopted since the p value equals asymptotically 1. As depicted by the current study findings (Prob>chi2=0.0001), the variables have a fixed effect and a fixed effect panel model will be applied. This is resultant of the significance value being less than the critical value (α) of 0.05, which lead to the null hypothesis being rejected.

4.3 Correlation Analysis

The current research employed the Pearson correlation analysis in establishing the link of the independent and control variables utilized in the research with the financial performance of the Kenyan commercial banks. The research applied a 95% confidence interval level and a two-tailed test was utilized. This is illustrated in Table 4.17.

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Table 4.17: Correlation Analysis

	ROA	Mobile~g	Intern~g	Agency~g	ATMs	BankSize
ROA	1.0000					
MobileBank~g	0.3783*	1				
	0.0000					
InternetBa~g	0.3909*	0.9615*	1.0000			
	0.0000	0.0000				
AgencyBank~g	0.3599*	0.7718*	0.8040*	1.0000		
	0.0000	0.0000	0.0000			
ATMs	0.4153*	0.8247*	0.8465*	0.7571*	1.0000	
	0.0000	0.0000	0.0000	0.0000		
BankSize	0.3811*	0.8074*	0.8137*	0.6908*	0.6765*	1.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	

As displayed in Table 4.17, there is a significant correlation amongst all the study's independent and control variables with the commercial banks' financial performance at the 5% significance level. Further, the conclusions specify that they are all positively significantly correlated with the commercial banks' financial performance.

4.4 Multiple Linear Regression

The effect of mobile banking, internet banking, agency banking, ATMs, and bank size on financial performance was established through the fixed effects panel multiple regression analysis. The significance value displayed in the ANOVA model and those obtained from the investigation were compared in the current research. The model coefficient significance values were also compared to the significance value of 0.05. Table 4.18 presents the results.

Table 4.18: Fixed Effects Panel Multiple Linear Regression

Fixed-effects (within) regression		Number of obs	=	361		
Group variable: NO		Number of groups	=	38		
R-sq: within	= 0.0466	Obs per group: min	=	3		
between	= 0.4794	avg	=	9.5		
overall	= 0.1506	max	=	10		
F(5,37)	= 4.04					
corr(u_i, Xb)	= -0.9115	Prob > F	=	0.0050		
(Std. Err. adjusted for 38 clusters in NO)						
Robust						
zROA	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
zMobileBan~g	-0.49279	0.804667	-0.61	0.544	-2.1232	1.137616
dzInternet~g	0.134159	0.190637	0.7	0.486	-0.25211	0.520426
zAgencyBan~g	-0.35043	0.300052	-1.17	0.25	-0.9584	0.25753
dzATMs	-0.19061	0.080644	-2.36	0.023	-0.35401	-0.02721
dzBankSize	0.141936	0.110392	1.29	0.207	-0.08174	0.365612
_cons	-0.00569	0.00293	-1.94	0.06	-0.01162	0.000252
sigma_u	1.3295822					
sigma_e	.79978815					
rho	.73429933	(fraction of variance due to u_i)				

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The R^2 specifies dependent variable variations (financial performance) which stems from the fluctuations in the independent variables and control variable. The overall R^2 value from the findings is 0.1506 which implies that 15.06% of financial performance changes are as a result of changes in the model entailing; mobile banking, internet banking, agency banking, ATMs, and bank size. This implied that other variables which are not incorporated in the model are attributable to the 84.94% of the changes in financial performance.

The research null hypothesis stated that the model entailing; mobile banking, internet banking, agency banking, ATMs, and bank size does not have a significant impact on the financial performance. The alternate hypothesis is that the model has a significant impact on the financial performance. The findings revealed a significance value of (Prob >F=0.0050) that is below the α (0.05) critical value leading to null hypothesis rejection. This implied that the model entailing; mobile banking, internet banking, agency banking, ATMs, and bank size significantly influences the financial performance. As a result, the model can be used to predict financial performance.

The null hypothesis also held that mobile banking, internet banking, agency banking, ATMs, and bank size have no significant relationship with financial performance. The study established that only the adoption of ATMs has a significant relationship with financial performance as the significance value (p=0.023) was below the critical alpha value (α) of 0.05 resulting to the rejection of the null hypothesis. Further, the current study findings revealed that ATMs and financial performance had a negative significant relationship. On the contrary, the current study findings established that mobile banking, internet banking, agency banking, and bank size did not have a significant effect on financial performance as their significance values were higher than the critical value (α) of 0.05. Mobile banking and agency banking both had a negative and significant effect on financial performance while both internet banking and bank size had a positive significant effect on financial performance.

The model indicated below was thus developed.

$$\mathbf{Y = -0.00569 - 0.19061X_1}$$

Where;

Y = Financial Performance

X_1 = ATMs

The constant co-efficient of -0.00569 implies that when there is absence of adoption of ATMs, the financial performance is at -0.00569 units. The beta coefficient of ATMs of -0.19061 means that an increment in adoption of ATMs by 100% would signify a decrease in financial performance by 19.06%.

5.0 Conclusions

The study concluded that advancements in financial technology impact on financial performance of commercial banks. Therefore, commercial banks should implement financial technology in their operations s as to augment their financial performance. The study also concluded that even though there is a discernible positive matching movements between mobile banking and financial performance, mobile banking has a weak negative relationship with financial performance. The current study sought to unravel the relationship between internet banking and the financial performance of commercial banks in Kenya. The current study concluded that even though there is a discernible positive matching movements between internet banking and financial performance, internet banking has a weak positive relationship with financial performance.

The study sought to unravel the relationship between agency banking and the financial performance of commercial banks in Kenya. The current study concluded that even though there is a discernible positive matching movements between agency banking and financial performance, agency banking has a weak negative relationship with financial performance. The study also sought to unravel the relationship between adoption of ATMs and the financial performance of commercial banks in Kenya. The current study findings showcased that adoption of ATMs had discernible positive matching movements with financial performance but however had a strong negative relationship with financial performance. Finally, the study sought to unravel the relationship between bank size and the financial performance of commercial banks in Kenya. The current study concluded that even though there is a discernible positive matching movements between bank size and financial performance, bank size banking has a weak positive relationship with financial performance.

6.0 Recommendations

Those who will conduct future research in the area of banking and also advancements in financial technology will benefit from the results of this study in regards to advancements in financial technology and bank financial performance. Subsequent researchers interested in advancements in financial technology and bank financial performance will use the study results as a reference. Similarly, the work will provide resourceful material for future scholars and researcher interested in the subject of advancements in financial technology and financial performance. Policy recommendations are made to the government officials and policy formulators in the Treasury and the Central Bank of Kenya (CBK), that since it has been established that the financial technology aspects entailing; mobile banking, internet banking, and agency banking did not have a significant effect on the banks' financial performance while adoption of ATMs had a significant negative impact of the banks' financial performance, the policy makers should not mainly advocate for financial technology policy as a means of boosting bank financial performance and it is recommended to the policy makers to utilize other policies when aiming to boost bank financial performance.

The findings of the study that the financial technology aspects entailing; mobile banking, internet banking, and agency banking did not have a significant effect on the banks' financial performance while adoption of ATMs had a significant negative impact of the banks' financial performance generates recommendations to the bank management and consultants not to mainly consider financial technology will significantly boost the banks' financial performance. They should employ other strategies, to shore up the banks' financial performance.

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