



**DIGITAL FINANCIAL INNOVATIONS AND FINANCIAL DEEPENING OF COMMERCIAL BANKS IN NAIROBI CITY  
COUNTY KENYA**

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**ABSTRACT**

*This study explored the effects of digital financial innovations on the financial deepening of Kenyan commercial banks so as to gain a better understanding of this phenomenon. The study aimed to investigate the following specific objectives: ascertain the impact of mobile phone banking, evaluate the influence of ATM banking, ascertain the impact of online banking and determine the effect of agency banking on the financial deepening of commercial banks in Kenya in the connection between financial innovations and financial deepening of commercial banks in Kenya. The study was conducted in Nairobi City County since that was where the banks have headquarters. The study was underpinned on the following theories the innovation diffusion theory, disruptive innovation theory, agency theory and the market power theory. This study was conducted using descriptive and explanatory research design that is cross sectional. The target audience consisted of 39 commercial banks that are licensed and functioning in Kenya as of December 31, 2022. The research involved secondary panel data. The primary source of secondary data was the annual banking report published by CBK. The analysis in this research was conducted using the SPSS version 20. Multiple regression was used to examine the correlation between the independent and dependent variables. The study's results were shown via the use of tables, charts, and figures. The study found that mobile phone banking, ATM banking, online banking and agency had positive significant effects on the financial deepening Kenyan commercial banks. The study concludes that mobile phone banking allows banks to reach a larger customer base, especially those in remote areas where physical bank branches are limited. With the widespread availability of ATMs across the country, customers no longer have to rely solely on bank branches for their banking needs. Online banking offers convenience and accessibility for customers in Kenya. Agency banking has significantly increased the accessibility of financial services for individuals in remote or underserved areas. The study recommends that commercial banks can invest in user-friendly interfaces and intuitive design to make mobile banking more accessible and convenient for customers. One-way commercial banks in Kenya are enhancing their ATM services is by increasing the number of ATMs across the country. With the increasing use of smartphones in Kenya, commercial banks can develop mobile banking apps that provide a seamless and convenient banking experience. One way to enhance agency banking in Kenya is to recruit more agents in rural and marginalized communities where traditional bank branches are scarce.*

**Key Words:** Mobile Phone Banking, ATM Banking, Online Banking, Agency Banking

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## INTRODUCTION

Financial deepening is critical in making decisions on the performance of institutions in the banking industry in Kenya. It stirs speculation through investment funds by expanding its asset base, raising the capital expected and credit, and raising the general profitability. The implementation of effective policies and programs in the Kenyan banking industry has resulted to a significant increase in financial resources. In 2013, monetary intermediaries contributed 7.2% to the country's GDP. Nevertheless, the financial health of Kenyan commercial banks has been volatile during the previous decade, regardless of factors such as monetary expansion or other characteristics. In 2008, the rate dropped as low as 1.5% (Ongore, 2018).

Commercial banks have a vital role in the global financial industry due to their job as intermediaries. Over the decades, the banking industry has seen significant transformations in its operational context, namely in terms of its organization and financial outcomes (Athanasoglou, Brissimis & Delis, 2018). The robust financial performance of commercial banks contributes to a stable and lucrative banking sector, as well as a resilient financial system that can withstand adverse shocks. In contrast, inadequate performance often triggers bank runs and bank crises, which in turn may lead to significant financial turmoil (Ongore & Kusa 2018).

In Kenya, Banks have implemented novel digital payment-based products, including M-shwari, Timiza, and M-Coop cash. Tala and Branch, which are non-bank institutions, have entered the credit industry by offering mobile money lending applications. Currently, digital payments have gained significant popularity as a preferred method of payment for products and services. In 2015, the digital credit/mobile banking channel was the most popular method of obtaining credit for day-to-day necessities and emergencies, representing 46.2% of these transactions. In comparison, MFIs, SACCOs, and conventional banking channels accounted for

3.6%, 8.2%, and 5.9% of such transactions, respectively. In 2019, the majority of Kenyans, accounting for 54%, chose to store their monies on digital wallets, making mobile money the most often used method of saving compared to informal savings clubs (known as Chama), SACCO, and banks, which were chosen by 29%, 11%, and 8% of the population, respectively (FSD, 2015; 2019).

Digital finance has emerged as important part in the use of technology by financial institutions. From an industrial perspective, digital finance is the accessibility of financial services using a digital infrastructure, like mobile phones or the internet, with restricted reliance on conventional banks and physical currency (McKinsey, 2016). According to Gomber *et al.* (2017), one of the key innovations is mobile payment technologies which facilitate secure, remote payments using mobile technologies like smartphones. Mobile technologies are associated with digital wallets, another financial innovation technique that enables users to store payment information, and conveniently make online purchases (Chandra, 2017). The mobile payment platforms leverage Near Field Communication (NFC) or QR codes for seamless transactions. Digital wallets integrate with multiple services, including e-commerce platforms and ride-sharing apps, enabling seamless transactions.

Conceptually, financial depth is based on the belief that different economic sectors and entities may capitalize on financial markets to save and make investment decisions, even over long periods of time (access). Financial intermediaries and markets can effectively allocate capital and handle large volumes of transactions without causing significant changes in market liquidity. Additionally, the financial sector can offer a wide range of assets to manage risks through hedging or diversification. Put simply, deep markets enable savers to explore a wide variety of investment and risk-sharing options, while also providing borrowers with access to a diverse range of financing and risk management tools (Nwaolisa & Cyril, 2019). Financial deepening is the expansion and enhancement of financial

services that are designed to benefit all segments of society. It also denotes the rise in the proportion of money supply to GDP or another price index. Financial deepening, as described by Sindani (2013), is the process by which the growth of the financial sector contributes to the overall economic development. The theory posits that an increase in the amount of easily accessible money in the economy leads to a greater number of possibilities for ongoing and sustainable economic expansion.

According to CBK (2022), Kenya has experienced a steady increase in both Gross loans and GDP in Kenya from 2018 to 2022. The Gross loans extended by financial institutions in Kenya rose from Ksh. 2,318.1 billion in 2018 to Ksh. 3,677.3 billion in 2022, an increase of approximately 58.7%. In tandem, the GDP of Kenya also grew from 92.2 billion USD in 2018 to 121.4 billion USD in 2022, a growth of about 31.7%. This upward trend in both Gross loans and GDP signals an expanding economy and an increased level of lending activity within the country. The growth in gross loans could be interpreted as a positive sign, as it suggests more people and businesses are gaining access to credit. This trend implies that financial services are reaching a larger segment of the population, a possible indication of the role played by finance innovation. Nevertheless, it is essential to take into account the contribution of various technologies to the financial deepening in Kenya (CBK, 2022).

According to Aduda and Kaulnda (2012), commercial banking in Kenya is a crucial component of the country's financial system. The country has a diverse mix of banks, including large multinational banks, regional banks, and smaller local banks that offer a wide range of services such as deposit-taking, lending, foreign exchange, and trade financing (Muthoka, 2020). The banks are of different tiers. The leading commercial banks in Kenya include Equity Bank, KCB Bank Kenya, Co-op Bank of Kenya, and Stan Chart Bank Kenya. KCB: KCB is the largest and one in the country of the largest in East Africa. Equity Bank Kenya, another prominent bank in Kenya popular for its financial

inclusion focus (CBK, 2020). The bank has a strong presence in Kenya and other countries in the region like DRC.

### **Statement of the Problem**

Several researches have been carried out on digital finance in the financial industry. Longitudinal research conducted by Lee et al. (2020) across 40 OECD countries from 1989 to 2011 revealed that banks situated in nations with a greater rate of financial innovation, namely in terms of ATM accessibility and electronic money transfers, demonstrate superior growth in their assets, loans, and profitability. Agufa (2016) discovered a statistically insignificant inverse correlation between agency banking and financial inclusion in Kenya. Mutua (2018) revealed that mobile money transactions positively affect financial inclusion while agency banking negatively effects financial inclusion. Kani and Obiosa (2020) found that automated teller machines (ATMs) and electronic fund transfers are negatively linked to return on equity (ROE) while internet banking and mobile banking is positively related with the same in Nigeria. The studies show mixed results concerning financial innovations and financial inclusions in advanced and developing countries. The introduction of financial innovations has significant differences outcomes for developed and developing countries.

Thus, while existing findings by Agufa (2016), Mutua (2018), Lee et al. (2020) and Kani and Obiosa (2020) provides valuable insights into the impacts of digital financial innovation on financial inclusion, profitability, and bank growth, it falls short of specifically analyzing the effect of these innovations on the financial deepening of financial institutions in the Kenyan context. Misati et al. (2022) show that the innovations have enormous potential. However, there is no extant literature that addresses the exact effect of digital innovations on the financial deepening in Kenya. Secondly, the country has experienced massive digital innovations in finance, but the lending remains non-commensurate with the GDP growth (Musau et al.,

2018). The two phenomena present a gap in the extant literature. Filling the knowledge gap on the impact of digital financial innovations on financial deepening in Kenya's commercial banking sector could provide crucial insights into why these innovations fail to meet their expectations and how their potential can be effectively harnessed to improve the depth and breadth of financial systems in the country.

### **Objectives of the Study**

The general aim of this research was to examine the effect of digital financial innovations on the financial deepening of commercial banks in Kenya. The study specific objectives are as follows:

- To assess the effect of mobile phone banking on the financial deepening Kenyan commercial banks.
- To ascertain the effect of ATM banking on financial deepening of Kenyan commercial banks.
- To evaluate the effect of online banking on financial deepening of Kenyan commercial banks.
- To find out the effect of agency banking on financial deepening of Kenyan commercial banks.
- To assess the effect of bank size as a moderating factor on the correlation between financial innovations and the level of financial deepening in commercial banks in Kenya.

### **LITERATURE REVIEW**

#### **Innovation Diffusion Theory**

This theory was postulated by Rogers (1962). The theory posits that organizations seeking development must be willing to engage in innovations. This theory proposes five essential characteristics of innovations: enhancement of existing methods, a systematic approach to performance, the ability to be pre-tested, and the ease of identifying any shortcomings (Frame & Scott, 2001). Hirtle (2005) asserts that institutions possess the ability to acquire a competitive edge and reduce operating expenses via the use of

innovative practices. In addition, Gardachew (2010) said that companies would readily enter new markets and explore different methods of providing service to their clients. The advantages of innovation are accompanied by several problems, including vulnerability to security risks, opposition from both management and consumers, the necessity for a sophisticated solution to existing circumstances, and the need for significant replacements owing to unpredictable and rapid technical advancements.

Gardachew (2010) states that the process of spreading an invention is facilitated by communication channels inside a social system. The innovation-decision process outlines the sequential steps that a person undergoes when considering the adoption of an invention. These steps include acquiring information about the innovation, forming an opinion about it, and making a choice about its adoption. Subsequently, the person starts to utilize the innovation and continues to diminish the residual uncertainty via practical application and acquisition of knowledge. Once the innovation has been accepted, the person persists in monitoring if further adoption remains logical for her. This approach encompasses all three measures of financial innovation.

#### **Disruptive Innovation Theory**

The disruptive innovation theory was postulated by Clayton Christensen in 1995 which serves to explain growth fueled by innovative advancements. Disruptive innovation refers to the phenomenon when a product or service first gains success in a less developed segment of a mature market and gradually displaces established rivals as it advances up the market hierarchy (Hang & Yu, 2010). This implies the emergence of a completely novel market and value network, which ultimately causes disruption to a existing market, value network, and reputable leading enterprises and alliances.

The theory delineates certain characteristics of a disruptive business environment. Sultan and van de Bunt-Kokhuis (2012) contend that established enterprises often have lower gross margins and

fewer target customers. In addition, their goods and services may seem relatively uncomplicated compared to the disruptive innovators, to the extent that they may not seem as appealing as current options. Consumers find these lower segments of the market unappealing due to their smaller profit margins. Christensen also defines low-end disruption as a strategy that specifically targets customers who do not need the complete performance that high-end consumers appreciate. Low-end disruption refers to a situation when the pace of improvement in goods surpasses the rate at which consumers can embrace the new level of performance. New-market disruptions often focus on clients whose requirements were not met by established incumbent enterprises (Sultan & van de Bunt-Kokhuis, 2012).

### **Agency Theory**

This theory was postulated by Jensen & Mackling in 1976. It posits that there is a need to separate the ownership and administration of an organization. Implementing this strategy in management often results in higher operational expenses owing to the need for greater monitoring and agency charges. This might potentially escalate conflicts among the stakeholders of the company and eventually diminish the benefits that can be obtained from an investment. This will deter investment and exacerbate agency tensions. Henderson & Pearson (2010) contend that financial institutions are motivated by the objective of optimizing shareholder value and profitability. This may be achieved by reducing operating costs and improving access to banking and financial services via the use of technology advancements to increase the quality service provision.

The Principal-Agent relationship inherently involves the expectation that the agent will act as a representative of the principal. The agent pledges their loyalty to the principle and simultaneously adheres to the principal's instructions and conducts themselves appropriately in carrying out their responsibilities. An agent is prohibited from personally benefiting from the successful business

opportunities that they discover in their role. Simultaneously, a principal bestows faith and trust onto the agent. These requirements lead to a trustworthy connection between the Principal and Agent. In 2009, the CBK implemented initiatives and strategies to expand banking channels to include non-bank agents. Agents were authorized to offer financial services by means of an amendment to the Banking Act 2009.

### **Market Power Theory**

Commercial bank profitability was analysed through the Market Power hypothesis, which suggests that a bank's performance is affected by the market structure of the sector. There are two unique methods to market power. One approach is based on the amount of concentration in the banking industry, which may lead to potential market power for banks. This potential market power can then have a direct impact on their financial success. Banks operating in markets with higher levels of concentration are more likely to generate abnormal profits by strategically reducing deposit rates and increasing loan rates due to collusive or monopolistic practices, regardless of their level of efficiency (Tregenna, 2009). Contrary to the Efficient Market Hypothesis, which suggests that market share affects the financial success of banks. This statement presupposes that only prominent financial institutions with unique offerings have the ability to impact market pricing and enhance their earnings. They possess the capability to exert control over the market and generate revenues that are not influenced by competition (Tregenna, 2009).

### **Mobile Phone Banking and Financial Deepening**

In Ndi's (2018) research, the influence of mobile phone technological advancements on the expansion of financial services in the banking sector in Kenya was examined. The study revealed that the money transfer service business in Kenya, as well as in other developing countries, may be characterized as an emergent, quickly expanding, and fast-paced market. The research revealed that mobile telecoms providers must strategically position

themselves and collaborate with financial institutions to integrate with mobile money transfer services. This is necessary for them to stay relevant and tap on the significant potential afforded by mobile users. Multiple cross-sectional research have been undertaken on telecommunications and economic growth indicators in emerging countries. Regardless, research has shown the existence of network externalities in the telecommunications system, resulting in increased growth effects. This research examined the strategic responses of Kenya Commercial Bank. The present investigation specifically concentrated on digital advancements.

#### **Automated Teller Machine and Financial deepening**

Omodele and Onyelwu (2019) examined the impact of the quality of service in electronic banking on client contentment in Nigeria. The study employed a descriptive survey research approach. The size of the sample was 93 participants. The primary research tool adopted was a questionnaire. The acquired data were examined utilizing descriptive statistics, followed by Pearson correlation and regression analysis to evaluate the hypotheses. The findings suggest a strong correlation between customer satisfaction and the different aspects of e-banking service quality. Additionally, e-banking service quality has a notable influence on customer satisfaction. Therefore, the study determined that banks are making significant investments in e-banking infrastructure. Consequently, customer satisfaction has become a critical factor for the success of e-banking services. This means that generating positive customer value in e-banking relies on establishing and maintaining long-term customer relationships. The research was undertaken in Nigeria, and the current study would be done in Kenya.

#### **Agency Banking and Financial Deepening**

Njoroge (2016) examined the implementation of technology and the efficacy of banking agencies in rural areas of Kenya. A sample of 20 financial institutions was chosen at random, and descriptive analysis was utilized. The findings revealed a

minimal proportion, notwithstanding the presence of agency banking services in the industry. This was caused by a combination of insecurity, lack of secrecy, and unskilled staff members who provided poor customer service. The study's research indicated that the deployment of agency banking in rural regions in Kenya had a significant impact on improving customer service, reducing costs, and expanding the presence of banks in distant locations. The research examined the implementation of technology and financial services in rural areas of Kenya. The current study focused on an urban area, namely Nairobi City County.

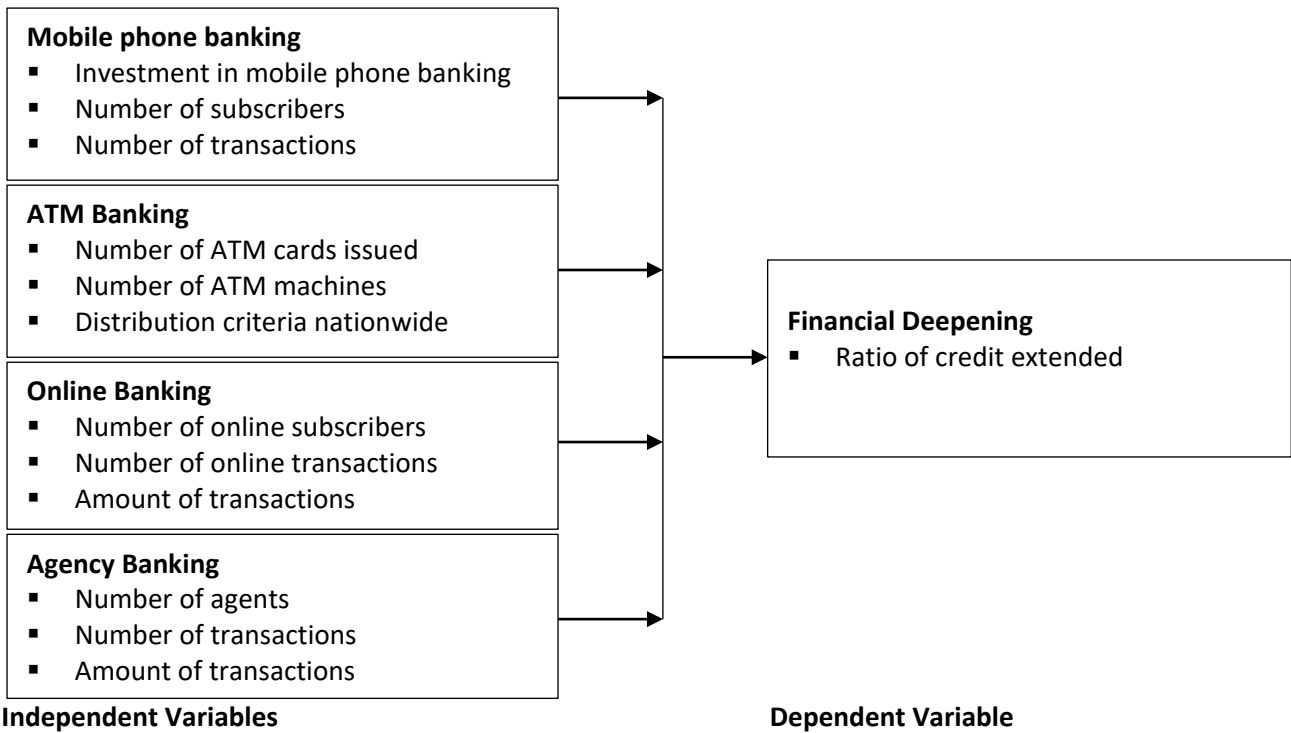
#### **Digital Financial Innovations, Bank Size and Financial Deepening**

The primary objective of all investments is to optimize the wealth of owners. Muhindi and Ngaba (2018) posit that changes in the size of a company might impact the kind and need for financial innovation, which can eventually lead to improved performance. Prastetyantoko and Parmono (2018) argue that big commercial banks have a greater competitive edge than small banks due to their ability to take advantage of economies of scale. Additionally, they possess the ability to tap into different sources of funding, which might allow them to quickly adapt to technological requirements.

Masika and Simiyu (2019) examined how company characteristics impact the financial performance of DT-SACCOs in Kenya. The research specifically analyzed the impact of factors such as business size, leverage, growth, and liquidity on financial performance. A retrospective study approach was used, and secondary data was collected from 2012-2016 from SACCOs in Nairobi County. The data was examined using descriptive statistics, correlation, and an OLS regression model. The research's findings demonstrated a clear and substantial correlation between the size of a corporation and the financial success of SACCOs. This research investigated the direct impact of the firm size. This research aims to examine how the size of a bank influences the link between financial innovation,

financial deepening, and the financial health of financial institutions.

**Conceptual Framework**



**Figure 1: Conceptual Framework**

**METHODOLOGY**

This study was conducted using descriptive and explanatory research design that is cross sectional. The target audience consisted of 39 commercial banks that are regulated and functioning in Kenya as of December 31, 2022.

Census approach was adopted for all the 39 commercial banks in Kenya. Census is good because it eliminates sampling bias (Courage, 2020). Panel data was collected over seven years (2016 to 2022) from annual financial statements of respective commercial banks.

The research utilized secondary panel data. The primary source of secondary data was the annual banking report published by the CBK. Validity was established by engaging in discussions with supervisors and a panel during the project presentation to review the research instrument. In addition, the research tool was reviewed by a statistician to confirm that there were limited chances of fitting a bogus regression model.

The data collected was examined via descriptive statistics and inferential statistics. The analysis in this research was conducted using the SPSS version 20. Multiple regression was utilized to examine the causal link between the independent and dependent variables.

**FINDINGS AND DISCUSSIONS**

**Descriptive Statistics Results**

The descriptive statistics analyzed involves use of mean, standard deviation, minimum and maximum values. The findings are presented as follows as per the research variable.

**Mobile Phone Banking**

The mobile phone banking was measured in terms of investment in Mobile phone banking Number of subscribers and number of transactions. The descriptive statistics results on mobile phone banking are presented in Table 1.



**Table 1: Mobile Phone Banking**

Indicators of mobile phone banking	N	Mean	Standard deviation	Minimum	Maximum
Investment in Mobile phone banking	39	4.566	0.4089	5.2440	11.3485
Number of subscribers	39	4.005	0.8151	1.2485	7.00610
Number of transactions	39	3.945	1.017	3.547	12.1941

**Source: Survey Data (2024)**

The results in Table 1 indicate that the investment in Mobile phone banking as measure of mobile phone banking had mean and standard deviation value of 4.566 and 0.4089 respectively. The minimum and maximum value of investment in mobile phone banking was 5.2440 and 11.3485 respectively. The descriptive values obtained indicate a higher investment in mobile phone banking by commercial banks. This is an indicator that investing in mobile phone banking has had a significant impact on the enhancement of financial depth in Kenyan commercial banks. Also, the finding indicates that investment in mobile phone banking had increased accessibility, facilitated financial inclusion, encouraged savings, and promoted the usage of formal financial products. The finding agrees with (Ongore & Kusa, 2018) who determined the impact of mobile phone technological advancements on the profitability of commercial banks in Kenya. The study revealed that factors such as perceived utility, convenience of use, risk management, and innovativeness had a favorable influence on the application of banking technologies.

The results in Table 1 indicate that the number of subscribers as measure of mobile phone banking had mean and standard deviation value of 4.005 and 0.8151 respectively. The minimum and maximum value of investment in mobile phone banking was 1.2485 and 7.00610 respectively. The findings indicate that there was increase in the number of mobile phone banking subscribers. Subscriber count plays a crucial role in the financial expansion of commercial banks in Kenya. A higher number of subscribers indicates a larger customer base, which in turn leads to increased deposits and

investments. This influx of funds allows banks to expand their lending activities, offer more financial products and services, and ultimately grow their revenue streams. The finding agree with (Al-Jabri, 2018) evaluated the impact of the implementation of mobile banking technology on the success of financial institutions in Saudi Arabia. The study found that the success of mobile banking was determined by the level of telecommunication penetration, the quality of the network, and the availability of mobile phones. The level of technical knowledge among the respondents influenced the adoption of mobile banking.

The results in Table 1 also indicate that the number of transactions as measure of mobile phone banking had mean and standard deviation value of 3.945 and 1.017 respectively. The minimum and maximum value of investment in mobile phone banking was 3.547 and 12.1941 respectively. This is an indicator that the commercial banks had increased their number of transactions. A higher transaction volume indicates a growing customer base and increased demand for financial services. As more individuals and businesses engage in financial transactions, commercial banks are compelled to expand their services to meet this demand. A higher transaction volume necessitates the development of robust infrastructure and technology. A higher transaction volume provides commercial banks with valuable data and insights. The findings concur with (Rayhan *et al.*, 2019) who researched the impact of mobile banking on financial health in Bangladesh. The use of mobile banking to expand market share may indicate a favorable effect on financial inclusion and the strengthening of financial services. Due to the

varying levels of economic development in Bangladesh and Kenya, it is not possible to generalize research results from Bangladesh to Kenya.

### ATM Banking

The ATM banking was measured in terms of number of ATM cards issued, number of ATM machines and distribution criteria. The descriptive statistics results on ATM banking are presented in Table 2.

**Table 2: ATM Banking**

Indicators of ATM banking	N	Mean	Standard deviation	Minimum	Maximum
Number of ATM cards issued	39	3.578	1.348	2.4510	7.3152
Number of ATM machines	39	4.416	0.3261	4.3394	12.371
Distribution criteria	39	4.050	0.7868	3.6641	10.524

**Source: Survey Data (2024)**

The results in Table 2 indicate that the number of ATM cards issued as measure of ATM banking had mean and standard deviation value of 3.578 and 1.348 respectively. The minimum and maximum value of ATM cards issued was 2.4510 and 7.3152 respectively. The findings show that the commercial banks had a large number of ATM cards. The issuance of ATM cards has facilitated the growth of electronic banking in Kenya. With the availability of ATM cards, customers can now withdraw cash, deposit money, transfer funds, and check their account balances electronically. The finding agrees with (Abdullahi & Nyaoga, 2018) who examined how the use of ATMs impacts the operational performance of commercial banks in Nakuru County. The utilization of ATMs has a favorable causal influence on the operational performance of commercial banks in Nakuru County. Customers were caught doing alternative financial transactions using their ATMs.

The results in Table 2 indicate that the number of ATM machines as measure of ATM banking had mean and standard deviation value of 4.416 and 0.3261 respectively. The minimum and maximum value of ATM machines was 4.3394 and 12.371 respectively. The finding indicates that commercial banks had increased their number of ATM machines. The introduction of automated teller machines (ATMs) in Kenyan commercial banks has had a significant impact on the expansion of financial services in the country because ATMs have

revolutionized the way banking services are delivered, making them more accessible and convenient for customers. The finding agree with (Omodele & Onyelwu, 2019) who examined the impact of the quality of service in electronic banking on client contentment in Nigeria. The findings suggest a strong correlation between customer satisfaction and the different aspects of e-banking service quality. Additionally, e-banking service quality has a notable influence on customer satisfaction.

The results in Table 2 also indicate that the distribution criteria as measure of ATM banking had mean and standard deviation value of 4.050 and 0.7868 respectively. The minimum and maximum value of ATM machines was 3.6641 and 10.524 respectively. The finding indicates the commercial banks had an effective distribution criteria of ATM services. By strategically placing ATMs in convenient locations, banks are able to reach a wider customer base and provide easier access to financial services. This, in turn, leads to increased financial inclusion and improved access to banking services for individuals in both urban and rural areas. The finding concurs with (Mwai, 2021) who aimed to ascertain the impact of ATM banking on the expansion of financial services provided by financial institutions in Kenya. The research demonstrated a favorable and substantial impact of mobile banking, ATM banking, and internet banking on the financial health of commercial banks in Kenya.

### Online Banking

The online banking was measured in terms of number of online subscribers, number of online

transactions and amount of transaction. The descriptive statistics results on online banking are presented in Table 3.

**Table 3: Online Banking**

Indicators of online banking	N	Mean	Standard deviation	Minimum	Maximum
Number of online subscribers	39	4.415	0.3845	7.5184	15.2643
Number of Online transactions	39	3.678	0.4518	10.251	19.5210
Amount of transaction	39	4.310	0.3345	6.641	11.245

#### Source: Survey Data (2024)

The results in Table 3 indicate that the number of online subscribers as measure of online banking had mean and standard deviation value of 4.415 and 0.3845 respectively. The minimum and maximum value of number of online subscribers was 7.5184 and 15.2643 respectively. This indicates that the number of online subscribers had increased through online banking services of commercial banks. The increase in the number of digital subscribers can indicate that more individuals are utilizing online banking services, which can lead to greater financial inclusion. The finding agrees with (Chipeta & Muthinja, 2018) who examined the impact of internet banking on financial outcomes. Temporal attributes had a substantial impact on financial success in comparison to industry attributes. Due to the limited number of financial institutions in Kenya (only 42), it was necessary to analyze panel data over lengthy periods of time in order to address the difficulties arising from a small sample size.

The results in Table 3 indicate that the number of online transactions as measure of online banking had mean and standard deviation value of 3.678 and 0.4518 respectively. The minimum and maximum value of number of online subscribers was 10.251 and 19.5210 respectively. This shows that there was a tremendous increase in the number of online transactions through online banking. As the number of online transactions continues to rise, commercial banks can leverage this data to tailor their services and offerings to better meet the evolving needs and preferences of their customers, ultimately leading to a more competitive and customer-centric banking

environment. The finding agrees with (Nasimiyu, 2018) who researched on the impact of e-banking on financial health in Migori County. The impact of electronic banking on the financial health of commercial banks in Migori County was substantial.

The results in Table 3 also indicate that the amount of transactions as measure of online banking had mean and standard deviation value of 4.310 and 0.3345 respectively. The minimum and maximum value of number of online subscribers was 6.641 and 11.245 respectively. The finding shows that there was a huge amount of transactions obtained by commercial banks through online banking services. A significant increase in the number and value of transactions indicates that customers are actively using online banking for various financial activities, such as bill payments, fund transfers, and loan applications. The finding concurs with (Mindani *et al.*, 2019) who examined the relationship between online banking as a financial distribution channel and the level of financial deepening in Kenya in a period of six years, from 2012 to 2017. The research resolved that online banking has an impact on the financial success of commercial banks in Kenya. The research suggested that banks must actively encourage more consumers to adopt online banking. The finding concurs with (Ogutu & Fatoki, 2019) who examined the impact of e-banking on the financial success of financial institutions that are listed in Kenya. The analysis revealed a strong and statistically significant correlation between mobile banking, agency banking, ATM banking, internet banking, and the financial health of commercial banks that are listed.

### Agency Banking

The agency banking was measured in terms of number of agents, number of transactions and

amount of transactions. The descriptive statistics results on agency banking are presented in Table 4.

**Table 4: Agency Banking**

Indicators of agency banking	N	Mean	Standard deviation	Minimum	Maximum
Number of agents	39	4.065	0.2645	4.2670	11.2675
Number of transactions	39	4.704	0.2041	9.1542	20.3514
Amount of transactions	39	3.990	1.0010	7.0640	15.2463

**Source: Survey Data (2024)**

The results in Table 4 indicate that the number of agents as measure of agency banking had mean and standard deviation value of 4.065 and 0.2645 respectively. The minimum and maximum value of number of online subscribers was 4.2670 and 11.2675 respectively. This shows that there was a substantial increase in the number of agents of commercial banks. The count of agents is an important metric for evaluating the success of agency banking in improving financial inclusion and expanding access to financial services for underserved populations. The finding agrees with (Njoroge, 2016) who examined the implementation of technology and the efficacy of banking agencies in rural areas of Kenya. The findings revealed a minimal proportion, notwithstanding the presence of agency banking services in the industry.

The results in Table 4 indicate that the number of transactions as measure of agency banking had mean and standard deviation value of 4.704 and 0.2041 respectively. The minimum and maximum value of number of online subscribers was 9.1542 and 20.3514 respectively. The volume of transactions serves as a key metric for commercial banks to assess the impact of agency banking on enhancing their financial depth. It provides insights into the reach, usage, and effectiveness of agency

banking services in expanding financial inclusion, promoting savings, facilitating access to credit, and building customer trust. The finding is consistent with (Kingori & Gekara, 2016) who explored the impact of agency banking on the profitability of financial institutions in Thika Town. The regression analysis demonstrated a favorable and statistically significant impact of agency banking on the success of commercial banks.

The results in Table 4 also indicate that the amount of transactions as measure of agency banking had mean and standard deviation value of 3.990 and 1.0010 respectively. The minimum and maximum value of number of online subscribers was 7.0640 and 15.2463 respectively. The finding indicates that the amount of transactions had increased through agency banking services of commercial banks. The finding is in line with (Mbugua & Omagwa, 2017) who examined how agency banking impacts the profitability of commercial banks specifically in Embu County. A study found that agency banking has a beneficial and noteworthy impact on financial success.

### Bank Size

The bank size was measured in terms of natural log and total asset. The descriptive statistics results on bank size are presented in Table 5.

**Table 5: Bank Size**

Indicators of agency banking	N	Mean	Standard deviation	Minimum	Maximum
Natural log	39	3.3451	1.6075	5.3125	9.2415
Total asset	39	4.5210	0.4780	10.2480	22.3641

**Source: Survey Data (2024)**

The results in Table 5 indicate that the natural log as measure of bank size had mean and standard deviation value of 3.3451 and 1.6075 respectively. The minimum and maximum value of number of online subscribers was 5.3125 and 9.2415 respectively. This finding shows that there was higher magnitude of commercial banks. The logarithm of a number can be used as a metric to measure the magnitude of a financial institution's impact on the expansion of financial services provided by commercial banks. By taking the logarithm of various factors such as assets under management, number of branches, customer base, and revenue, we can quantify the size and reach of a financial institution in the market. The finding agrees with (Nzioka, 2020) who claims that deposits are the amount of funds entrusted to the bank by customers. Bankers with higher deposits are considered larger and vice versa. On the other hand, the number of branches reflect the physical presence of the bank.

The results in Table 5 also indicate that the total asset as measure of bank size had mean and standard deviation value of 4.5210 and 0.4780

**Table 6: Financial Deepening**

Indicators of agency banking	N	Mean	Standard deviation	Minimum	Maximum
Ratio of credit extended	39	4.1561	0.8387	11.5498	17.6253

**Source: Survey Data (2024)**

The results in Table 6 also indicate that the ratio of credit extended as measure of financial deepening had mean and standard deviation value of 4.1561 and 0.8387 respectively. The minimum and maximum value of number of online subscribers was 11.5498 and 17.6253 respectively. The finding indicates that there was a rise in the ratio of credit extended of commercial banks. A rising credit extended ratio signifies that a bank is effectively channeling funds from savers to borrowers, thereby mobilizing financial resources and promoting capital formation. Furthermore, a high credit extended ratio indicates that a bank has a robust risk management framework in place. Banks need to carefully assess the creditworthiness of borrowers

respectively. The minimum and maximum value of number of online subscribers was 10.2480 and 22.3641 respectively. The finding show that the total assets of the commercial banks had increased. A larger bank size, as reflected by a higher total asset, generally indicates a greater ability to mobilize and allocate financial resources efficiently. The finding agree with (DeYoung & Hunter, 2001) who hold that commercial banks which have a vast network of branches and ATMs is typically considered larger and vice versa. In addition, (Nzioka, 2013) also claims that the number of customers that the bank serves can also be used for bank size evaluation. A large customer base and employees implies a larger banking industry and vice versa. Likewise, the loan value, revenues and profits provide insights into the size and financial strength of the bank.

#### **Financial Deepening**

The study analyzed the financial deepening of commercial which was measured in terms of ratio of credit extended. The descriptive statistics results on financial deepening are presented in Table 6.

and manage the associated risks to maintain a healthy loan portfolio. The finding concur with (Sindani, 2013), who observe that financial deepening is the process by which the growth of the financial sector contributes to the overall economic development. The theory posits that an increase in the amount of easily accessible money in the economy leads to a greater number of possibilities for ongoing and sustainable economic expansion.

#### **Inferential Statistics Results**

The inferential statistics involved the use of correlation analysis and multiple regressions analysis. The results are presented as follows;

### Correlation Analysis

Correlation analysis was done to quantify the association between the independent and

dependent variables. The findings are presented in Table 7.

**Table 7: Correlation Analysis**

		Mobile phone banking	ATM banking	Agency banking	Online banking	Financial deepening
<b>Mobile phone banking</b>	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	39				
<b>ATM banking</b>	Pearson Correlation	.114	1			
	Sig. (2-tailed)	.214				
	N	39	39			
<b>Agency banking</b>	Pearson Correlation	.307	.264 **	1		
	Sig. (2-tailed)	.118	.341			
	N	39	39	39		
<b>Online banking</b>	Pearson Correlation	.296 *	.178 **	.194 **	1	
	Sig. (2-tailed)	.038	.065	.0241		
	N	39	39	39	39	
<b>Financial deepening</b>	Pearson Correlation	.771 **	.804 **	.796 **	.739 **	1
	Sig. (2-tailed)	.001	.002	.000	.001	
	N	39	39	39	39	39

Source: Survey Data (2024)

The results indicated in Table 7 shows that the Pearson r value for mobile phone banking, ATM banking, agency banking and online banking against financial deepening was 0.771, 0.804, 0.796 and 0.739 respectively which were all closer to 1. In addition, the level of significance was below 0.05 at 0.000 respectively. Therefore, it can be concluded that there was a very strong correlation between the independent variables and dependent variable. The finding agrees with Ongore and Kusa (2018) research that revealed that factors such as perceived utility, convenience of use, risk management, and innovativeness had a favorable

influence on the application of banking technologies. The finding concurs with (Mutiso & Senelwa, 2019) research results which demonstrated a robust and statistically significant correlation between ATM banking and financial success. The finding is also consistent with Njoroge (2016) study findings which revealed a minimal proportion, notwithstanding the presence of agency banking services in the industry.

### Regression Analysis

The results of the joint regression analysis starting with model summary, analysis of variance (ANOVA) and coefficients are displayed below.

**Table 8: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.899 <sup>a</sup>	.808	.876	1.021

**Source: Survey Data (2024)**

The results presented in Table 8 shows that the adjusted R<sup>2</sup> was 0.876. This means that there was a variation of 87.6% of financial deepening of commercial banks attributed to mobile phone

banking, ATM banking, agency banking and online banking. Therefore, there was a gap of 12.4% that represent other variables not studied

**Table 9: Model Summary of Variables**

Model	R	R Square	Adjusted R Square
1	.794 <sup>a</sup>	0.630	0.621

Model	Sum of Squares	df	Mean square	F	Sig
1. Regression	90.541	1	90.541	230.189	.001
Residual	3.540	9	0.3933		
Total	94.081	10			

Model	Unstandardized Coefficients	Standardized Coefficients	Beta	t	Sig
	B	Std. Error			
1 (Constant)	.367	.285		1.288	.001
Financial innovations	.709	.317	.0461	2.237	.000

**Source: Survey Data (2024)**

The findings in Table 9 indicate that the adjusted R<sup>2</sup> was 0.621. This means that 62.1% of variation of financial innovation of commercial banks can be described by bank size with the remaining 37.9% representing other variables apart from bank size. The statistical F value is 230.189 which is greater than the statistical mean value of 90.541. In addition, the level of significance is less than 0.05 at 0.01. Therefore, the model is significant in determining the moderating effect. The findings also indicate that when financial innovation is kept constant, the bank size would be 0.367. An

improvement in financial innovations would improve bank size by 0.709. The resulting regression equation is expressed as follows;

$$\text{Bank size} = 0.367 + 0.709 (\text{financial innovations})$$

The findings also indicate that there is a positive significant moderating effect of bank size on financial innovations ( $\beta=0.0461$ ,  $p=0.000$ ).

**Step 2: Bank size and financial deepening**

The second step involved regressing bank size and the<sup>1</sup> financial deepening of commercial banks in Kenya. The results are presented in Table 10.

**Table 10: Bank Size and Financial Deepening**

Model	R	R Square	Adjusted R Square			
1	.801 <sup>a</sup>	0.642	0.636			
Model	Sum of Squares	df	Mean square	F	Sig	
1. Regression	101.209	1	101.209	162.367	.002	
Residual	5.610	9	0.6233			
Total	151.819	10				
Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig
	B	Std. Error	Beta			
1 (Constant)	.415	.219			1.895	.000
Bank size	.642	.116	.0264		5.534	.002

Source: Survey Data (2024)

The findings in Table 10 indicate that the adjusted R<sup>2</sup> was 0.642. This means that 64.2% of variation of financial deepening of commercial banks can be described by bank size with the remaining 35.8% representing other variables apart from bank size. The statistical F value is 162.367 which is greater than the statistical mean value of 101.209. In addition the level of significance is less than 0.05 at 0.00. Therefore, the model is significant in determining the moderating effect. The findings also indicate that when bank size is kept constant, the financial deepening would be 0.642. An improvement in bank size would improve financial deepening of commercial banks by 0.642. The

resulting regression equation is expressed as follows;

$$\text{Financial deepening} = 0.415 + 0.642 (\text{financial deepening})$$

The findings also indicate that there is a positive significant moderating effect of bank size on financial deepening ( $\beta=0.0264, p=0.002$ ).

Step 3: Bank size, financial innovations and financial deepening

The third step dealt with a regression analysis on bank size, financial innovations and financial deepening. The results are presented in Table 11.

**Table 11: Bank Size, Financial Innovations and Financial Deepening**

Model	R	R Square	Adjusted R Square			
1	.800 <sup>a</sup>	0.640	0.632			
Model	Sum of Squares	df	Mean square	F	Sig	
1. Regression	121.204	2	60.602	77.353	.000	
Residual	7.051	9	0.783			
Total	191.255	10				
Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig
	B	Std. Error	Beta			
1 (Constant)	.618	.257			2.405	.000
Financial innovations	.772	.296	.0219		2.608	.002
Bank size	.805	.307	.300		2.622	.001

Source: Survey Data (2024)

The findings in Table 11 indicate that the adjusted R<sup>2</sup> was 0.640. This means that 64.0% of variation of

financial deepening of commercial banks can be described by bank size and financial innovations



with the remaining 36.0% representing other variables apart from bank size and financial innovations. The statistical F value is 77.353 which is greater than the statistical mean value of 60.602. In addition the level of significance is less than 0.05 at 0.00. Therefore, the model is significant in determining the moderating effect. The findings also indicate that when bank size and financial innovations are kept constant, the financial deepening would be 0.618. The regression coefficients indicate that an improvement in bank size and financial innovation would improve financial deepening of commercial banks by 0.772 and 0.805 respectively. The resulting regression equation is expressed as follows;

$$\text{Financial deepening} = 0.618 + 0.772 (\text{financial innovations}) + 0.805 (\text{bank size})$$

**Table 12: Analysis of Variance**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	301.123	4	75.281	195.468	.001
	Residual	103.215	268	0.3851		
	Total	131.338	272			

**Source: Survey Data (2024)**

The results in Table 12 indicate that the significance value is at 0.001 which is below 0.05. The results further indicate that the statistical value of F was at

The findings also indicate that there is a positive significant moderating effect of bank size on financial deepening ( $\beta=0.300$ ,  $p=0.001$ ). In addition, there is a positive significant effect of financial innovation on financial deepening of commercial banks in Kenya ( $\beta=0.0219$ ,  $p=0.002$ ). Therefore, the study concludes that the bank size statistically affect the connection between financial innovation and financial deepening of commercial banks in Kenya. The finding agrees with (Nzioka, 2020) who claims that deposits are the amount of funds entrusted to the bank by customers. Bankers with higher deposits are considered larger and vice versa. On the other hand, the number of branches reflect the physical presence of the bank.

195.468 which was more than the statistical value of mean square at 75.281. This implied that the model was significant.

**Table 13: Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	.678	.251		2.701	.001
	Mobile phone banking	.705	.119	.2415	5.924	.000
	ATM banking	.779	.237	.0264	3.287	.001
	Online banking	.841	.336	.1174	2.503	.002
	Agency banking	.753	.192	.3645	3.922	.000

**Source: Survey Data (2024)**

The results presented in Table 13 indicate that the financial deepening Kenyan commercial banks would be 0.678 when mobile phone banking, ATM banking, online banking and agency banking are kept constant. The regression coefficients obtained indicate that an improvement in mobile phone

banking, ATM banking, online banking and agency banking would improve the financial deepening Kenyan commercial banks by 0.705, 0.779, 0.841 and 0.753 respectively. Therefore, the final regression equation obtained is outlined as follows;

Financial deepening = 0.678 + 0.705 (mobile phone banking) + 0.779 (ATM banking) + 0.841 (online banking) + 0.753 (agency banking)

## CONCLUSIONS AND RECOMMENDATIONS

The study concludes that mobile phone banking allows banks to reach a larger customer base, especially those in remote areas where physical bank branches are limited. This expands the reach of banking services and promotes financial inclusion, as more individuals can access and utilize banking services through their mobile phones. Mobile phone banking enhances the efficiency and convenience of banking transactions. Customers can perform various banking activities such as account balance inquiries, fund transfers, bill payments, and loan applications directly from their mobile phones. Mobile phone banking promotes financial literacy and education. Through mobile banking apps, customers can access educational resources, financial tips, and tools that help them make informed financial decisions.

The study concludes that ATM banking in Kenya has revolutionized the way people access and manage their finances. With the widespread availability of ATMs across the country, customers no longer have to rely solely on bank branches for their banking needs. This has not only increased convenience for customers but has also led to a significant increase in financial inclusion. ATM banking has played a crucial role in the financial deepening of commercial banks in Kenya. By expanding their reach and making banking services more accessible to a wider population, commercial banks have been able to attract more customers and increase their deposit base.

The study concludes that online banking offers convenience and accessibility for customers in Kenya. With online banking, customers can access their accounts and perform various transactions anytime and anywhere, without the need to visit a physical bank branch. This saves time and effort for customers, especially those who live in remote areas or have busy schedules. Online banking

provides a wide range of financial services. Customers can perform basic transactions such as checking account balances, transferring funds between accounts, and paying bills online. Additionally, online banking platforms often offer more advanced services such as applying for loans, opening new accounts, and investing in various financial products. This allows customers to have a comprehensive view of their financial situation and easily manage their finances.

The study concludes that agency banking has significantly increased the accessibility of financial services for individuals in remote or underserved areas. By partnering with agents who are located in these areas, commercial banks can extend their reach beyond traditional brick-and-mortar branches. This allows individuals who previously had limited or no access to banking services to conveniently deposit, withdraw, and transfer funds, as well as access other basic banking services. Agency banking has improved the overall customer experience by providing convenient and accessible banking services. Customers no longer need to travel long distances to reach a bank branch, saving time and money. Additionally, agents often operate during extended hours, including weekends, providing flexibility for customers who may have limited availability during traditional banking hours. This convenience and flexibility have made banking services more attractive and accessible to a wider range of individuals.

The study concludes that the size of banks plays a crucial role in enhancing financial depth in commercial banks in Kenya because larger banks have the capacity to offer a wider range of financial products and services, which in turn attracts more customers and increases the overall financial depth in the banking sector. Additionally, larger banks are better equipped to invest in technology and innovation, which can improve the efficiency and effectiveness of their operations. This can lead to lower costs for customers and increased convenience in accessing financial services. Furthermore, the size of banks can also enhance

financial stability in the banking sector. Larger banks are often more diversified in terms of their assets and liabilities, which can help to mitigate risks and reduce the likelihood of financial crises.

The study recommends that commercial banks can invest in user-friendly interfaces and intuitive design to make mobile banking more accessible and convenient for customers. This can include features such as biometric authentication, personalized dashboards, and real-time notifications. Commercial banks can implement advanced security measures such as two-factor authentication, encryption, and fraud detection algorithms to protect customers' sensitive information and prevent unauthorized access to their accounts. Commercial banks can introduce new services and features on their mobile banking platforms, such as bill payments, loan applications, investment options, and insurance services. This can provide customers with a more comprehensive and convenient banking experience.

The study recommends that one-way commercial banks in Kenya are enhancing their ATM services is by increasing the number of ATMs across the country. This expansion ensures that individuals in both urban and rural areas have easy access to banking services. By placing ATMs in remote locations, commercial banks are reaching previously underserved populations, allowing them to deposit, withdraw, and transfer funds conveniently. Furthermore, commercial banks are also improving the functionality of their ATMs to cater to the needs of a diverse customer base. This includes offering services such as bill payments, mobile phone top-ups, and even loan applications through ATMs. By providing these additional services, commercial banks are not only promoting financial inclusion but also making banking more convenient for their customers.

The study recommends that with the increasing use of smartphones in Kenya, commercial banks can develop mobile banking apps that provide a seamless and convenient banking experience. These apps can offer features such as balance inquiries,

fund transfers, bill payments, and account management. By providing a mobile banking app, banks can cater to the growing demand for mobile banking services and attract more customers. Commercial banks can enhance their security measures by implementing multi-factor authentication, encryption technologies, and real-time fraud detection systems. By assuring customers of the safety of their online transactions, banks can build trust and encourage more people to use their online banking services.

The study recommends that one way to enhance agency banking in Kenya is to recruit more agents in rural and marginalized communities where traditional bank branches are scarce. These agents can act as a bridge between the bank and the customers, providing basic banking services and facilitating transactions on behalf of the bank. This not only increases the accessibility of financial services but also creates employment opportunities in these areas. Furthermore, improving the technology and infrastructure supporting agency banking can help streamline operations and make it more efficient for both banks and agents. This includes investing in secure and user-friendly mobile banking platforms, providing training and support for agents, and ensuring reliable connectivity in remote areas.

The study recommends that one way in which banks can enhance their size through financial innovation is by introducing new digital banking solutions. This can include mobile banking apps, online banking platforms, and digital payment systems. By offering these services, banks can reach a wider customer base and provide more convenient and efficient banking options. Additionally, banks can also innovate in terms of their product offerings. This can include introducing new loan products, investment options, and insurance services. By diversifying their product portfolio, banks can attract more customers and increase their revenue streams.

### Suggestions for Further Studies

The study suggests that there is need to carry out further studies that address the other variables not studied to cover the gap of 12.4% identified in regression analysis that represent other variables

not studied. The study suggests that further studies should be done that focus on other commercial banks financial innovations that have not been studied to address the gap left out such as SACCOs and microfinance institutions in Kenya.

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