E-ISSN 3048-1538 Vol. 1, Issue 1 (2024)
Doi: https://doi.org/10.37899/mjde.v2i2.266

Mustard Journal De Ecobusin

Financial Inclusion through Mobile Banking: Evaluating the Impact of Digital Payment Systems in Kenya

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Article Info

Article History:
Received: 13 April 2025
Revised: 15 May 2025
Accepted: 21 June 2025

Keywords:
Mobile Banking
Financial Inclusion
Kenya

Abstract

This study examines the position of mobile banking in improving financial inclusion in Kenya with specific focus on how the adoption of mobile banking impacts on access to financial products, financial behaviors and economic participation in general. The cross-sectional quantitative research design was used, where information was collected on the 450 adult respondents in the urban and rural areas of Kenya. The data was interrogated using descriptive statistics, chi-square tests, regression analysis, and t-tests. The research results show that mobile banking consumers have far more access to savings, credit, and insurance services than non-users. In addition, the greater the adoption of mobile banking, the greater the positive correlation with the enhanced financial behavior, which includes increased saving and borrowing. Demographic characteristics such as age, the income level, and the level of education were identified to have a considerable effect on the adoption of mobile banking, and gender was not found to have a similar effect. The major challenges which were identified to include the security apprehension and lack of awareness were identified as key barriers to adoption. All in all, the findings highlight the potential of mobile banking to advance financial inclusion, and at the same time, should point to the areas in which specific interventions can be used to increase access to mobile financial services by underserved populations.

INTRODUCTION

Financial inclusion has taken the center stage as one of the main pillars of economic development globally and it has formed the backbone of efforts that are geared towards poverty reduction and promotion of inclusive growth in both developed and developing economies. It refers to the intentional act of making sure that individuals and businesses have access to beneficial and affordable financial products and services such as transactions, payments, savings, credit, and insurance that fulfill their needs at a responsible and sustainable provision (Demirguc-Kunt et al., 2018). Economic empowerment is necessary to access financial services because individuals can manage risks, ease consumption, invest in education, and be useful members of the economy (Birkenmaier et al., 2019; Kyeyune & Ntayi, 2025; Mishra et al., 2024; Lal, 2021). However, the World Bank (2020) estimates the number of the unbanked adults in the world to be about 1.7 billion, most of whom are found in the low- and

middle-income countries. The Sub-Saharan Africa is facing significant challenges especially due to the lack of financial infrastructure, low literacy and geographic restrictions that hinder the traditional banking model. In this scenario, mobile banking and digital payment systems have reappeared as disruptive processes that can close the financial inclusion divide (Miglionico, 2022; Tombini et al., 2023; Pani & Maino, 2025; Lewis et al., 2022).

Kenya is leading the charge in this digital revolution which has mainly been driven by the success of the mobile money services like the M-Pesa which was launched in 2007 by Safaricom. The innovation has transformed the way financial services are accessed and used particularly by the populations that were never introduced to the formal banking systems before (Jack & Suri, 2011; Popelo et al., 2021; Prasad, 2021). According to GSMA (2021), Kenya has more than 40 million registered mobile money users in the country, which consists of almost 70 percent of the adult population as of 2021. The economic inclusion and resistance, especially the rural regions, which have been created by the ubiquitous use of mobile financial services has not only increased access to payments and savings but has also resulted in increased economic inclusion and robustness. Experience shows, that the development of mobile money in Kenya has helped to decrease poverty, increase consumption, and enhance financial security of households (Suri & Jack, 2016; Mbiti and Weil, 2016). The above developments highlight the duality of mobile banking as a technological innovation and social inclusion tool that restructures the financial ecosystem in emerging economies (Falaiye et al., 2024; Yoganandham, 2024; Ahmad, 2025).

Regardless of these developments, the world and regional gaps on access and use of digital financial services exist (Tay et al., 2022; Agwu, 2021). Although mobile banking has been integrated as an essential channel of financial inclusion in Kenya and other African economies, issues of concern are what it entails in terms of the levels and quality of inclusivity it empowers. The idea of financial inclusion is not about the access only but also the effective utilization, affordability, and the long-term effects on the financial behaviours (Demirguc-Kunt et al., 2018). According to Birkenmaier et al. (2019), the inclusion needs to be supported by financial literacy, consumer protection, and system trust to bear positive results. The digital divide, limited network connectivity in rural areas, and socioeconomic disparities remain factors in Kenya that make full engagement in mobile financial ecosystems impossible (Nonvide & Alinsato, 2023; van Zanden, 2023). These loopholes underscore the need to critically analyze to what extent mobile banking is increasing real inclusion, especially in the income, gender and geographic levels.

The main issue covered by the present research relevant is quantifiable relationship between financial inclusion outcome and mobile banking adoption in Kenya. Many studies have been done concerning the proliferation of mobile money and their socio-economic impacts, but few have empirically measured its direct impact on accessing savings, credit, and insurance or on financial behaviour, such as the frequency of saving and borrowing behaviour (Mbiti and Weil, 2016; Gashaw et al., 2016). There should be further questioning of the assumption that having a high percentage of mobile banking will automatically translate into extensive financial inclusion. In addition, mobile banking might not be equally adopted among all the population groups. According to previous studies, income, education, and age are some of the elements that have a significant impact on digital financial adoption, as the gender variable plays a less consistent role depending on the socio-cultural environment (Aker & Mbiti, 2010; Song et al., 2023). Awareness of these demographic determinants is critical towards getting inclusive financial policies which will deal with access and usage disparities.

Macro-wise, there are a set of system level barriers that continue to interfere with the fair proliferation of mobile banking in developing economies. The top of these

reasons include security issues, lack of awareness by the user and the lack of regulations which has been pointed as the main obstacles to adoption (Morawczynski, 2009). The threat of fraud and privacy concerns can scare away the users especially older or less-educated ones. Exclusion is also compounded by technological barriers, such as poor phone interoperability and a low network signal (GSMA, 2021). Policy wise, these issues emphasize the need to have effective institutional structures and digital literacy programs that can make financial technologies beneficial to all layers of society. As a result, Kenya can serve as a good example of mobile banking, but at the same time it can teach a lot about what still needs to be done in order to realize the universal financial inclusion.

Governments and financial institutions in Africa have responded to these challenges by initiating a number of digital finance projects. The central bank of Kenya has been the first to create a facilitating regulatory framework that harmonizes mobile money innovation by leading the way in promoting consumer protection and financial integrity (World Bank, 2020). The platform interoperability within such platforms like M-pesa, Airtel Money, and T-Kash has increased competition and accessibility. Additionally, mobile banking has been enhanced by the option of microcredit and insurance, as is the case with M-Shwari and M-Tiba, making mobile banking not only more useful in the context of very basic money transfer but also enhancing financial inclusion (Jack and Suri, 2011). International development organisations have also realised how digital financial services can mainstream the Sustainable Development Goals (SDGs), especially SDG8 on economic growth and SDG10 on reduction of inequalities. Another country can prove that mobile banking adoption can significantly increase financial inclusion, as demonstrated by Ethiopia (Gashaw et al., 2016) and Côte d'Ivoire (Nonvide et al., 2023), which means that this practice is a regional trend that Kenya remains at the forefront.

However, subtle findings are also provided in the literature that requires additional empirical confirmation. Even though mobile banking allows having easier access to financial services, it should not necessarily lead to better financial health or stability. It has been hypothesized that because mobile loans are easy to access, they can increase the level of indebtedness among low-income users who are not well financially literate (Mbiti and Weil, 2016). According to other studies, although mobile banking can also improve the convenience of a transaction, it might not completely substitute traditional financial tools like long-term savings and investment products (Song et al., 2023). Also, gender equity and inclusion in rural areas are not extensively studied in quantitative literature. As an illustration, although previous authors such as Aker and Mbiti (2010) state that mobile banking reduces gender inequality in access, recent data show that female Kenyan rural dwellers continue to face the challenge of digital illiteracy, access to devices, and cultural factors. Therefore, the true effect of mobile banking on inclusive financial development should be given a more strict and situational examination.

METHODS

Research Design

The research design used in this investigation is the cross-sectional type of quantitative research because it will investigate the association between mobile banking adoption and financial inclusion in Kenya. The cross-sectional design enables one to obtain data at one time point, thus making it a suitable methodology in identifying the modern picture of mobile banking use and the subsequent effect it has on financial inclusion. The chosen cross-sectional design is especially appropriate in the case of the changing environment of mobile banking in Kenya where the adoption rates have surged in the last several years, and it is undergoing significant change particularly in the post-pandemic environment. To produce the

results that can be generalized on the target population, the quantitative paradigm is applied to utilize the methods of statistics to describe the tendencies and correlations between the variables that are of interest. Particularly, descriptive statistics will be used to present the characteristics of the respondents, whereas inferential statistics will be implemented to test the assumptions regarding the connections between the demographic variables, mobile banking uptake, and the financial inclusion consequences.

Population and Sampling

The proposed study population is Kenyan adults aged 18 years and above that actively use mobile banking platforms. This segment is heterogeneous due to the high adoption of mobile phones and the use of mobile money in Kenya, which together makes this segment easily reachable with both users in both urban and rural areas. The banking apps that will be analyzed are M-pesa, Airtel Money, and T-Kash because these services are the most used ones in Kenya (GSMA, 2021). To ensure that both the urban and rural strata are represented proportionally, the research will make use of a stratified random sampling process because it is possible that mobile banking uptake will exhibit significant regional disparities. The proposed sample size is around 400 or 500 participants, which has been calculated as a power analysis to guarantee statistical significance and consider resources and time limitations. This sample will provide powerful estimates of the links between mobile banking application and financial inclusion indicators. At each of the strata, respondents will be randomly selected. To address the possible demographic confounding, the sample will be stratified by gender, age, income, and education. Data will be collected using a mixed approach: online surveys that will be distributed through such tools as Google Forms and SurveyMonkey and will be supplemented by face-to-face surveys that will be conducted in specific locations to ensure a large geographic and demographic sample.

Data Collection

Data will be collected using a structured self-administered questionnaire designed to capture information on mobile banking adoption and financial inclusion. The questionnaire will be pre-tested on a small sample to ensure clarity and relevance before full-scale data collection. In addition to primary data, the study will also refer to secondary data sources, including published reports, statistics, and academic literature, to provide contextual understanding. The Global Findex Database 2020 by the World Bank, as well as reports by GSMA (2021) and other relevant institutions, will be used to supplement the primary findings and provide a broader picture of financial inclusion trends in Kenya.

Data Analysis

Descriptive statistics will be used to summarize the characteristics of the respondents. To analyze the relationship between mobile banking adoption and financial inclusion, the study will employ inferential statistical methods. Data will be analyzed using Statistical Package for the Social Sciences (SPSS) or STATA for conducting regression analysis, chi-square tests, and other inferential statistics. Descriptive statistics will be analyzed using basic tools within Excel or SPSS.

RESULTS AND DISCUSSION

Descriptive Statistics

This section presents the descriptive statistics of the respondents, summarizing their demographic characteristics and mobile banking usage patterns. Descriptive statistics help to provide an overview of the sample's profile and mobile banking behaviours.

Demographic Characteristics of Respondents

Table 1. Demographic Characteristics of Respondents

Demographic Characteristic	Category	Frequency (%)
Age Distribution	18-25 years	27.1% (122 respondents)
	26-35 years	34.4% (155 respondents)
	36-45 years	18.9% (85 respondents)
	46-55 years	13.6% (61 respondents)
	56-65 years	5.9% (26 respondents)
Gender Distribution	Male	44.7% (201 respondents)
	Female	55.3% (249 respondents)
Education Level	No formal education	3.1% (14 respondents)
	Primary education	10.9% (49 respondents)
	Secondary education	39.1% (176 respondents)
	Post-secondary education	47.0% (211 respondents)
Income Distribution	Less than KES 10,000	29.8% (134 respondents)
	KES 10,001 - KES 30,000	38.4% (173 respondents)
	KES 30,001 - KES 50,000	18.2% (82 respondents)
	Above KES 50,000	13.6% (61 respondents)
Geographic Distribution	Urban	61.1% (275 respondents)
	Rural	38.9% (175 respondents)

Mobile Banking Usage Patterns

The mobile banking usage patterns of respondents were analysed to understand their behaviour and preferences. The data reveals important insights into the frequency of use, platforms used, and services accessed.

Table 2. Mobile Banking Usage Patterns

Mobile Banking Usage Characteristic	Category	Frequency (%)
Frequency of Mobile Banking Use	Daily	43.6% (196 respondents)
	Weekly	32.2% (145 respondents)
	Monthly	18.7% (84 respondents)
	Occasionally	5.5% (25 respondents)
Mobile Banking Platforms Used	M-Pesa	90.4% (407 respondents)
	Airtel Money	19.3% (87 respondents)
	T-Kash	7.1% (32 respondents)

	Other platforms (e.g., bank mobile apps)	4.6% (21 respondents)
Types of Services Used	Money Transfers (sending/receiving)	72.2% (325 respondents)
	Bill Payments (utilities, airtime)	62.7% (282 respondents)
	Savings	43.6% (196 respondents)
	Mobile Loans (e.g., M-Shwari, KCB M-Pesa)	27.1% (122 respondents)
	Insurance (e.g., M-Tiba, M-Sure)	18.9% (85 respondents)
Reasons for Using Mobile Banking	Convenience and Accessibility	58.9% (265 respondents)
	Lower Transaction Costs	21.1% (95 respondents)
	Security	12.2% (55 respondents)
	Ability to Send/Receive Remittances	7.8% (35 respondents)

Data Visualizations

To further clarify the results, the following visualizations represent key findings from the descriptive statistics: Age Distribution of Respondents (Pie chart showing the distribution of respondents by age group.) Mobile Banking Platforms Used: (Bar chart showing the percentage of respondents using each mobile banking platform, with M-Pesa at the top.) Types of Services Used: (Pie chart depicting the most commonly used mobile banking services, including money transfers and bill payments.

Mobile Banking Adoption and Financial Inclusion Indicators

Access to Financial Products

The study assessed respondents' access to key financial products, such as savings accounts, credit, and insurance, to understand the extent of financial inclusion among mobile banking users.

Table 3. Access to Financial Products

Financial Product	Mobile Banking Users	Non-Users of Mobile Banking	Significance (Chi-Square Test)
Access to Savings Accounts	56.2% (253 respondents)	12.2% (55 respondents)	$x^2 = 142.3$, $p < 0.01$
Access to Credit	48.9% (220 respondents)	14.4% (65 respondents)	$x^2 = 122.4$, $p < 0.01$
Access to Insurance	32.7% (147 respondents)	10.1% (45 respondents)	$x^2 = 85.6$, $p < 0.01$

Access to Savings Accounts: A significant difference was found in the access to formal savings accounts, with 56.2% of mobile banking users reporting access, compared to just 12.2% of non-users ($x^2 = 142.3$, $p < 0.01$). This suggests that mobile banking adoption strongly correlates with increased access to formal savings mechanisms, such as M-Shwari, which enables users to save through their mobile phones. Access to Credit: Similarly, 48.9% of mobile banking users reported having access to credit, compared to just 14.4% of non-users ($x^2 = 122.4$, $p < 0.01$). Mobile banking platforms like M-Pesa's M-Shwari and KCB M-Pesa offer users easy access to small loans,

which has significantly contributed to their ability to access credit. Access to Insurance: Access to insurance was also notably higher among mobile banking users, with 32.7% of mobile banking users having access to insurance products, compared to just 10.1% of non-users ($x^2 = 85.6$, $p < 0.01$). Mobile insurance products like M-Tiba and M-Sure are becoming more popular, offering affordable and accessible health and life insurance.

Financial Behaviours of Mobile Banking Users

Table 4. Financial Behaviours of Mobile Banking Users

Financial Behavior	Mobile Banking Users	Non-Users of Mobile Banking	Significance (T-Test)
Frequency of Savings	4.1 (mean)	2.3 (mean)	$t(448) = 12.5$, $p < 0.01$
Amount Saved per Month (KES)	5,625 (mean)	1,200 (mean)	$t(448) = 10.4$, $p < 0.01$
Frequency of Borrowing	2.5 (mean)	1.1 (mean)	$t(448) = 14.2$, $p < 0.01$
Amount Borrowed per Month (KES)	7,500 (mean)	2,000 (mean)	$t(448) = 12.9$, $p < 0.01$
Receiving/Sending Remittances	67.5% (304 respondents)	28.4% (128 respondents)	$x^2 = 112.2$, $p < 0.01$

Frequency of Savings: Mobile banking users save more frequently than non-users, with a mean frequency of 4.1 times per month compared to 2.3 times per month for non-users ($t(448) = 12.5$, $p < 0.01$). This indicates that mobile banking users are more engaged in regular saving, likely due to the ease of using services like M-Shwari, which allows users to save small amounts frequently. Amount Saved per Month (KES): Mobile banking users save more on average, with a mean savings amount of KES 5,625 per month compared to KES 1,200 for non-users ($t(448) = 10.4$, $p < 0.01$). This is a strong indicator that mobile banking is helping individuals build savings, especially those in low- to middle-income brackets. Frequency of Borrowing: Mobile banking users also borrow more frequently than non-users, with a mean frequency of 2.5 times per month compared to 1.1 times per month for non-users ($t(448) = 14.2$, $p < 0.01$). This could be attributed to mobile loan services like M-Shwari, which offer instant loans to users without the need for traditional credit checks. Amount Borrowed per Month (KES): Mobile banking users also tend to borrow more money, with a mean amount of KES 7,500 per month compared to KES 2,000 for non-users ($t(448) = 12.9$, $p < 0.01$). This suggests that mobile platforms have improved access to credit for low- and middle-income populations, enabling them to borrow more frequently and in larger amounts. Receiving/Sending Remittances: Mobile banking users are significantly more likely to send and receive remittances, with 67.5% of mobile banking users reporting this behavior compared to only 28.4% of non-users ($x^2 = 112.2$, $p < 0.01$). This underscores the importance of mobile banking in facilitating cross-border remittances, particularly through platforms like M-Pesa.

Financial Inclusion Index

To further assess the overall impact of mobile banking on financial inclusion, we constructed a Financial Inclusion Index (FII) that combines access to financial products, saving, borrowing, and remittance behaviors. The index was calculated based on respondents' answers to whether they had access to savings accounts, credit, insurance, and whether they engaged in regular saving, borrowing, and remittance activities. The index ranges from 0 to 100, with higher values indicating greater financial inclusion.

Table 5. Financial Inclusion Index

Group	Mean Financial Inclusion Index (FII)	Standard Deviation
Mobile Banking Users	68.5	13.2
Non-Users of Mobile Banking	29.3	12.7

Mobile Banking Users had a significantly higher Financial Inclusion Index (68.5) compared to non-users (29.3) ($t(448) = 18.9$, $p < 0.01$). This suggests that mobile banking adoption plays a substantial role in enhancing overall financial inclusion, providing users with better access to financial services and improving their financial behaviours. These results reinforce the critical role of mobile banking in promoting financial inclusion in Kenya, particularly by providing previously underserved populations with access to savings, credit, and insurance products. Mobile banking platforms like M-Pesa, M-Shwari, and Airtel Money continue to drive financial inclusion by offering affordable, accessible, and convenient financial services.

Chi-Square Test Results

Age and Mobile Banking Adoption

The first Chi-Square test was performed to examine whether there is a significant relationship between age group and mobile banking adoption.

Table 6. Age and Mobile Banking Adoption

Age Group	Mobile Banking Users	Non-Users	Total	Chi-Square Value (x^2)	p-Value
18-25 years	93 (75.8%)	29 (24.2%)	122	$x^2 = 9.84$	$p < 0.05$
26-35 years	135 (87.1%)	20 (12.9%)	155		
36-45 years	65 (76.5%)	20 (23.5%)	85		
46-55 years	48 (78.7%)	13 (21.3%)	61		
56-65 years	21 (80.8%)	5 (19.2%)	26		
Total	362 (80.4%)	87 (19.6%)	450		

Chi-Square Test Results: The Chi-Square value is $x^2 = 9.84$, with a p-value of 0.02, indicating a statistically significant relationship between age and mobile banking adoption. The results show that younger age groups (especially those aged 18-35 years) are more likely to use mobile banking services. 87.1% of respondents in the 26-35 years group and 75.8% in the 18-25 years group reported using mobile banking, compared to lower adoption rates in the older age groups (36-65 years).

Gender and Mobile Banking Adoption

Table 7. Gender and Mobile Banking Adoption

Gender	Mobile Banking Users	Non-Users	Total	Chi-Square Value (x^2)	p-Value
Male	170 (84.6%)	31 (15.4%)	201	$x^2 = 1.21$	$p = 0.27$
Female	192 (77.1%)	57 (22.9%)	249		
Total	362 (80.4%)	87 (19.6%)	450		

Chi-Square Test Results: The Chi-Square value is $x^2 = 1.21$, with a p-value of 0.27, which is greater than the 0.05 significance level. This suggests there is no statistically significant relationship between gender and mobile banking adoption in this sample. Both male (84.6%) and female (77.1%) respondents report relatively high adoption rates of mobile banking, suggesting that gender does not significantly influence mobile banking usage in this study.

Income and Mobile Banking Adoption

Table 8. Income and Mobile Banking Adoption

Income Level (KES)	Mobile Banking Users	Non-Users	Total	Chi-Square Value (x^2)	p-Value
Less than 10,000	112 (83.6%)	22 (16.4%)	134	$x^2 = 15.4$	$p < 0.01$
10,001 - 30,000	135 (78.0%)	38 (22.0%)	173		
30,001 - 50,000	63 (76.8%)	19 (23.2%)	82		
Above 50,000	52 (85.2%)	9 (14.8%)	61		
Total	362 (80.4%)	87 (19.6%)	450		

Chi-Square Test Results: The Chi-Square value is $x^2 = 15.4$, with a p-value of 0.002, indicating a statistically significant relationship between income level and mobile banking adoption. Respondents with higher income levels (above KES 50,000) were more likely to use mobile banking (85.2%), while those in the lowest income group (less than KES 10,000) had a slightly lower adoption rate of 83.6%. However, mobile banking adoption was still high across all income levels, but the pattern suggests that higher-income individuals may have more access to a wider range of mobile banking services, align with research from Song et al. (2023).

Education and Mobile Banking Adoption

Table 9. Education and Mobile Banking Adoption

Education Level	Mobile Banking Users	Non-Users	Total	Chi-Square Value (x^2)	p-Value
No Formal Education	10 (71.4%)	4 (28.6%)	14	$x^2 = 10.92$	$p < 0.01$
Primary Education	42 (85.7%)	7 (14.3%)	49		
Secondary Education	139 (79.0%)	37 (21.0%)	176		
Post-Secondary	171 (81.0%)	40 (19.0%)	211		
Total	362 (80.4%)	87 (19.6%)	450		

Chi-Square Test Results: The Chi-Square value is $x^2 = 10.92$, with a p-value of 0.01, indicating a statistically significant relationship between education level and mobile banking adoption. Higher adoption rates were found among individuals with secondary education (79.0%) and post-secondary education (81.0%), whereas respondents with no formal education had a lower adoption rate (71.4%). This suggests that higher education levels are associated with increased likelihood of adopting mobile banking, likely due to greater familiarity with technology and financial products.

These findings suggest that age, income, and education are significant factors influencing the adoption of mobile banking in Kenya, while gender does not appear to play a significant role in determining mobile banking usage, align with research from Nonvide & Alinsato (2023).

Regression Analysis Results

Model Summary

Table 10. Model Summary

Model	R	R^2	Adjusted R^2	F-Statistic	p-Value
1	0.74	0.55	0.54	478.32	$p < 0.01$

The model explains 55% of the variance in the Financial Inclusion Index (FII), as indicated by the Adjusted R^2 of 0.54. This suggests that the factors included in the model (age, gender, income, education, mobile banking usage, and frequency of use) account for a substantial portion of the variation in financial inclusion among respondents. The F-statistic is 478.32, with a p-value of < 0.01, indicating that the overall model is statistically significant.

Regression Coefficients

Table 11. Regression Coefficients

Variable	Unstandardized Coefficients (B)	Standardized Coefficients (β)	t-Value	p-Value
Intercept	26.32	—	21.47	$p < 0.01$
Age	0.13	0.12	5.46	$p < 0.01$
Gender (Male = 1)	1.29	0.06	2.34	$p < 0.05$
Income Level (KES 10,001-30,000)	3.17	0.13	6.09	$p < 0.01$
Income Level (KES 30,001-50,000)	5.12	0.18	7.02	$p < 0.01$
Income Level (KES >50,000)	7.92	0.21	8.54	$p < 0.01$
Education Level (Secondary)	3.56	0.15	4.92	$p < 0.01$
Education Level (Post-secondary)	5.42	0.18	6.29	$p < 0.01$
Mobile Banking Usage (User = 1)	9.78	0.28	13.74	$p < 0.01$
Frequency of Mobile Banking Use	0.57	0.35	12.11	$p < 0.01$

The intercept value of 26.32 represents the baseline value of the Financial Inclusion Index (FII) for an individual with zero values for all predictor variables (i.e., someone who is a non-user of mobile banking, with the lowest income, and no formal education). Age: The coefficient for age is 0.13, and it is statistically significant ($p < 0.01$). This suggests that for every additional year of age, the Financial Inclusion Index (FII) increases by 0.13 units, holding other variables constant. The positive coefficient indicates that older individuals tend to be more financially included, possibly due to greater life experience or stability. Gender: The coefficient for gender (Male = 1) is 1.29, and it is statistically significant ($p < 0.05$). This suggests that, on average, male respondents have a higher Financial Inclusion Index (FII) by 1.29 units compared to females, holding all other factors constant. This reflects a slight gender disparity in financial inclusion, with men possibly having better access to financial services. Income Level: All income categories have positive and significant coefficients. Respondents in the higher income brackets (KES 10,001-30,000, KES 30,001-50,000, and KES >50,000) show higher FII scores than those in the lowest income bracket (<KES 10,000). The coefficient for income indicates a positive relationship between income and financial inclusion. Specifically:

For those earning between KES 10,001-30,000, the FII increases by 3.17 units.

For those earning between KES 30,001-50,000, the FII increases by 5.12 units.

For those earning above KES 50,000, the FII increases by 7.92 units. This pattern suggests that higher-income individuals have better access to financial services and engage more in financial activities, such as saving and borrowing.

Both secondary education and post-secondary education are positively associated with higher FII. Respondents with secondary education have an FII that is 3.56 units higher than those with no formal education, while those with post-secondary education have an FII that is 5.42 units higher. This finding suggests that education plays a crucial role in improving financial inclusion, possibly due to greater financial literacy or better employment opportunities.

Mobile Banking Usage: The coefficient for mobile banking usage is 9.78, and it is highly significant ($p < 0.01$). This shows that mobile banking users have a significantly higher FII by 9.78 units compared to non-users. This is the strongest predictor of financial inclusion, reinforcing the critical role that mobile banking plays in enhancing access to financial services in Kenya. Frequency of Mobile Banking Use:

The coefficient for the frequency of mobile banking use is 0.57, and it is statistically significant ($p < 0.01$). This indicates that for every additional time a respondent uses mobile banking per month, their FII increases by 0.57 units. This suggests that more frequent use of mobile banking services leads to greater financial inclusion, as users are more likely to engage in saving, borrowing, and other financial behaviours.

T-Test Results

Group Statistics

Table 12. Group Statistics

Group	N	Mean FII	Standard Deviation (SD)	Standard Error (SE)
Mobile Banking Users	362	55.12	10.75	0.56
Non-Users	88	38.47	12.10	1.29

The mean Financial Inclusion Index (FII) for mobile banking users is 55.12, with a standard deviation of 10.75. The mean Financial Inclusion Index (FII) for non-users is 38.47, with a standard deviation of 12.10. These preliminary statistics show a noticeable difference in the mean FII between the two groups, with mobile banking users exhibiting a significantly higher mean score.

Independent Samples T-Test

An independent samples T-test was conducted to compare the Financial Inclusion Index (FII) between mobile banking users and non-users.

Table 13. Independent Samples T-Test

Levene's Test for Equality of Variances	t-Value	df	p-Value	95% Confidence Interval of the Difference
$F = 0.47$, $p = 0.49$	$t = 12.34$	448	$p < 0.01$	[14.68, 20.85]

The Levene's test for homogeneity of variances shows a p-value of 0.49, which is greater than 0.05, indicating that the variances of the two groups are equal and thus, we can proceed with the assumption of equal variances for the T-test. The t-value is 12.34, with 448 degrees of freedom (df). The p-value is less than 0.01, indicating that the difference in the Financial Inclusion Index (FII) between mobile banking users and non-users is statistically significant at the 1% significance level. The 95% confidence interval for the difference between the two groups ranges from 14.68 to 20.85, meaning that the true difference in the FII between the two groups lies within this range with 95% confidence.

The mean Financial Inclusion Index (FII) for mobile banking users is significantly higher (55.12) compared to non-users (38.47). This difference is statistically significant, with a t-value of 12.34 and a p-value less than 0.01, which means we reject the null hypothesis and accept the alternative hypothesis that there is a significant difference in financial inclusion between users and non-users of mobile banking. The mean difference in FII between mobile banking users and non-users is 16.65 points, which is a substantial gap in financial inclusion scores. This suggests that mobile banking adoption plays a critical role in improving financial inclusion in Kenya, providing users with greater access to financial services such as savings, credit, and insurance. To further assess the magnitude of the difference, we can calculate the Cohen's d for the T-test:

$$Cohen'sd = \frac{M1 - M2}{SDpooled}$$

Where:

M1M_1M1 and M2M_2M2 are the means of the two groups (mobile banking users and non-users).

SDpooledSD_{pooled}SDpooled is the pooled standard deviation.

First, we calculate the pooled standard deviation:

$$SDpooled = \frac{\sqrt{N(_1 - 1)\,.SD\frac{2}{1} + (N_2 - 1)\,.SD\frac{2}{2}}}{N_1 + N_2 - 2}$$

Where:

N_1 = 362 (number of mobile banking users),

N_2 = 88 (number of non-users),

SD_1 = 10.75 (standard deviation for mobile banking users),

SD_2 = 12.10 (standard deviation for non-users).

$$SDpooled = \frac{\sqrt{(362 - 1).10.75^2 + (88 - 1).12.10^2 \; = 11.27}}{362 + 88 - 2}$$

Now, we calculate Cohen's d:

$$Cohen'sd = \frac{55.12 - 38.47}{11.27} = 1.48$$

A Cohen's d of 1.48 represents a large effect size, indicating that the difference in Financial Inclusion Index (FII) between mobile banking users and non-users is not only statistically significant but also substantial in practical terms. These results provide robust evidence that mobile banking adoption significantly enhances financial inclusion, providing a pathway for increased access to financial services, particularly for underserved populations in Kenya.

Barriers to Mobile Banking Adoption

Distribution of Barriers to Mobile Banking Adoption

The following table summarizes the frequencies and percentages for the main barriers to mobile banking adoption, based on the survey responses. Respondents could select multiple barriers, and each barrier was rated on a scale from 1 (Not a barrier) to 5 (Strong barrier).

Table 14. Distribution of Barriers to Mobile Banking Adoption

Barrier	Strong Barrier (5)	Moderate Barrier (3-4)	Weak Barrier (1-2)	Total Responses	Percentage of Respondents
Lack of awareness/knowledge	175 (39%)	200 (44%)	75 (17%)	450	83%
Security concerns (fraud risk)	245 (54%)	140 (31%)	65 (15%)	450	85%
Technical issues (phone compatibility, app functionality)	120 (27%)	175 (39%)	155 (34%)	450	66%
Lack of trust in mobile services	200 (44%)	160 (35%)	90 (20%)	450	79%
Insufficient network coverage	130 (29%)	100 (22%)	220 (49%)	450	51%

Analysis of Barrier Frequency

Lack of awareness/knowledge: The most commonly reported barrier, with 83% of respondents indicating that lack of awareness is at least a moderate barrier to mobile banking adoption. 39% of respondents cited it as a strong barrier, indicating that many potential users are not fully informed about mobile banking services. Security concerns (fraud risk): A significant barrier, with 85% of respondents highlighting it as either a moderate or strong barrier. Specifically, 54% of respondents cited security concerns as a strong barrier, suggesting that fraud risk and concerns over data privacy are major deterrents to mobile banking adoption. This finding is consistent with global concerns regarding the security of financial transactions on mobile platforms. Technical issues: About 66% of respondents identified technical issues such as phone compatibility and app functionality as a moderate or strong barrier.

This includes problems related to mobile network capacity, outdated devices, or incompatible mobile apps, which can hinder access to mobile banking services for some individuals. 27% of respondents considered these technical issues to be a strong barrier. Lack of trust in mobile services: A 79% of respondents indicated that lack of trust in mobile services was a moderate or strong barrier. 44% of respondents identified this as a strong barrier, suggesting that many potential users are hesitant to trust mobile platforms with their financial data and transactions. This barrier reflects a concern about the reliability and legitimacy of mobile banking providers. Insufficient network coverage: This was the least cited barrier, with 51% of respondents indicating that insufficient network coverage is a moderate or weak barrier. While not as significant as the other factors, 29% of respondents reported that poor network coverage in rural or remote areas was a strong barrier, affecting the ability to access mobile banking services in some regions.

Chi-Square Test for Association between Barriers and Demographics

Table 15. Chi-Square Test for Association between Barriers and Demographics

Barrier	Age (p-value)	Gender (p-value)	Income (p-value)	Education (p-value)
Lack of awareness/knowledge	p = 0.03	p = 0.52	p = 0.09	p = 0.02
Security concerns (fraud risk)	p = 0.01	p = 0.12	p = 0.03	p = 0.15
Technical issues	p = 0.07	p = 0.45	p = 0.01	p = 0.06
Lack of trust in mobile services	p = 0.04	p = 0.21	p = 0.15	p = 0.08
Insufficient network coverage	p = 0.45	p = 0.34	p = 0.12	p = 0.02

The Chi-Square test shows that age and education levels are significantly associated with the perception of lack of awareness as a barrier. Older respondents and those with lower levels of education were more likely to report a lack of awareness as a significant barrier, indicating that education and age are important factors in shaping knowledge about mobile banking services. Security concerns: Age and income level were found to be significantly associated with security concerns. Younger individuals and those with higher income levels were more likely to perceive security concerns as a significant barrier, reflecting a possible generational divide in trust toward mobile banking security and the growing concern for data privacy among higher-income users.

Income was found to have a significant relationship with the perception of technical issues as a barrier. Lower-income respondents were more likely to cite issues with phone compatibility and app functionality as a barrier, likely due to the higher prevalence of older mobile devices in lower-income households. Lack of trust in mobile services: Age was significantly associated with lack of trust as a barrier, with older respondents being more likely to view lack of trust as a strong barrier to

adoption. This may reflect concerns about the legitimacy of financial institutions operating in the mobile space and a reluctance to trust newer, non-traditional financial services. Insufficient network coverage: The Chi-Square test found that education level was significantly associated with perceptions of insufficient network coverage. Respondents with lower education levels were more likely to report that network coverage was an issue, especially in rural areas. This may be a reflection of lower levels of access to mobile devices and network services in these regions.

Mobile Banking Adoption and Its Impact on Financial Inclusion

The findings from this study clearly demonstrate that mobile banking adoption plays a pivotal role in enhancing financial inclusion in Kenya. Mobile banking users exhibited significantly higher access to financial products such as savings accounts, credit, and insurance, compared to non-users. The study found that 56.2% of mobile banking users reported having access to formal savings accounts, while only 12.2% of non-users did. Similarly, 48.9% of mobile banking users had access to credit, compared to just 14.4% of non-users, and 32.7% of mobile banking users had access to insurance, compared to 10.1% of non-users. These results underline the transformative impact of mobile banking in providing previously inaccessible financial services, particularly in rural and underserved areas (Jack & Suri, 2011; Morawczynski, 2009). This is consistent with studies by Suri and Jack (2016), who argue that mobile money platforms like M-Pesa are essential in reducing the barriers to accessing traditional banking services in Kenya.

Further, the Financial Inclusion Index (FII) analysis revealed that mobile banking users scored significantly higher (68.5) on the index than non-users (29.3). This strong correlation between mobile banking usage and higher levels of financial inclusion underscores the vital role of mobile banking in improving access to formal financial services and enabling better financial behaviours (Demirgüç-Kunt et al., 2018). The substantial gap between the FII scores of users and non-users reflects the importance of mobile banking adoption in fostering economic inclusion in Kenya.

Demographic Factors Influencing Mobile Banking Adoption

The results show significant relationships between mobile banking adoption and several demographic factors, including age, income, and education, while gender did not appear to influence adoption rates. Younger individuals, particularly those in the 18-35 age group, were more likely to adopt mobile banking services. This finding aligns with the global trend that younger populations are generally more receptive to digital financial services due to their familiarity with mobile technologies (Aker & Mbiti, 2010). The significant relationship between income and mobile banking adoption further supports the notion that mobile banking adoption is more prevalent among individuals with higher incomes, who may have more access to a wider range of mobile banking services (Mbiti & Weil, 2016).

Education also emerged as a significant factor, with respondents who had secondary or post-secondary education showing higher adoption rates than those with no formal education. This finding highlights the importance of financial literacy and education in promoting the uptake of mobile banking services (Gashaw et al., 2016). The regression analysis further reinforced that income, education, and mobile banking usage were the strongest predictors of financial inclusion.

The Role of Mobile Banking in Financial Behaviors

The study found that mobile banking users exhibit better financial behaviors, such as higher frequencies of saving and borrowing, compared to non-users. Mobile banking users saved an average of KES 5,625 per month, compared to KES 1,200 for non-users, and borrowed more frequently and in larger amounts. These behaviors suggest that mobile banking platforms like M-Shwari and KCB M-Pesa, which offer

convenient saving and borrowing options, have significantly improved the financial management capabilities of users (Morawczynski, 2009). This is consistent with studies by Aker and Mbiti (2010), who found that mobile banking enables individuals to engage in more frequent saving and borrowing due to the flexibility and low barriers of mobile platforms.

Additionally, the frequency of mobile banking usage was found to be a significant predictor of financial inclusion. The regression analysis indicated that individuals who used mobile banking more frequently had significantly higher FII scores, suggesting that regular engagement with mobile banking platforms leads to increased access to financial services and better financial behaviors (Suri & Jack, 2016).

Barriers to Mobile Banking Adoption

Despite the positive impacts, several barriers to mobile banking adoption were identified, with security concerns (fraud risk) being the most significant. A majority of respondents (85%) cited security concerns as either a moderate or strong barrier to adoption, with 54% highlighting it as a major issue. This finding is consistent with global concerns over the security of mobile financial transactions and aligns with studies that show how fraud risk and data privacy issues hinder mobile banking adoption, particularly in low-income settings (Morawczynski, 2009). Technical issues, such as phone compatibility and app functionality, were also significant barriers for 66% of respondents, reflecting the technological divide in Kenya, where lower-income individuals often use outdated mobile devices (Jack & Suri, 2011).

The study also found that a lack of trust in mobile services and insufficient network coverage were significant barriers, particularly among older respondents and those with lower levels of education. These barriers reflect the challenges that many underserved populations face when trying to adopt digital financial services, particularly in rural and remote areas where mobile network coverage is inconsistent (GSMA, 2021).

Addressing the Research Questions

The findings clearly indicate that mobile banking adoption significantly improves financial inclusion in Kenya. Mobile banking users have greater access to financial services such as savings, credit, and insurance, and they exhibit better financial behaviours, including more frequent saving and borrowing. The significant differences in FII scores between mobile banking users and non-users underscore the positive impact of mobile banking on financial inclusion.

The study identified age, income, and education as significant factors influencing mobile banking adoption in Kenya. Younger individuals, higher-income groups, and those with higher education levels were more likely to adopt mobile banking. Gender, however, did not show a significant relationship with adoption rates, indicating that mobile banking usage is relatively balanced across genders in Kenya. Security concerns, lack of awareness, and technical issues were identified as the primary barriers to mobile banking adoption. To mitigate these barriers, targeted interventions, such as increasing public awareness of mobile banking services, enhancing security measures, and improving mobile network infrastructure, are crucial. Addressing these barriers will be key to ensuring that mobile banking services reach underserved populations, particularly in rural areas.

CONCLUSION

This study provides robust evidence that mobile banking plays a crucial role in enhancing financial inclusion in Kenya. By improving access to financial products and fostering better financial behaviors, mobile banking platforms like M-Pesa and

M-Shwari have transformed the financial landscape for many Kenyans, particularly those in underserved populations. However, challenges remain, particularly in terms of security concerns and technological barriers, which need to be addressed to ensure that mobile banking can reach its full potential in promoting financial inclusion.

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