MOBILE MONEY USAGE AND FINANCIAL INCLUSION IN KADUNA STATE, NIGERIA
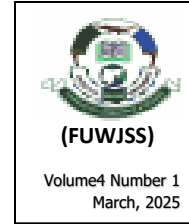
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Abstract
Financial inclusion remains a critical challenge in Nigeria, particularly in Kaduna State, where limited access to banking services constrains economic participation. Mobile money has emerged as a potential solution, offering financial services through digital platforms. However, the adoption of Mobile Money in Kaduna State remains uneven due to infrastructural deficits, financial illiteracy, and socio-cultural barriers. This study examines the impact of mobile money on financial inclusion, analyzing demographic factors and barriers to adoption. Using a multi-stage sampling approach, data was collected from 2,100 respondents across six Local Government Areas in Kaduna State. A logistic regression model was employed to assess the determinants of mobile money usage. The results indicate that education and income levels significantly influence mobile banking adoption, with educated and higher-income individuals more likely to use mobile money services. Furthermore, socio-cultural norms and inadequate infrastructure hinder financial inclusion in rural areas. The study concludes that education and income levels significantly influence mobile money adoption, with higher-educated and higher-income individuals more likely to use these services. Rural areas experience greater financial exclusion due to limited network coverage and low agent penetration, highlighting the need to address these challenges for inclusive economic growth. Therefore, the study underscores the need for targeted interventions, including financial literacy programs and expanded agent networks, to bridge the financial inclusion gap. These insights are crucial for policymakers, financial institutions, and telecommunication providers in designing effective strategies to enhance digital financial accessibility in Kaduna State.

Keywords: Mobile money, financial inclusion, digital finance, logistic regression bank agents

Introduction

Financial inclusion can be viewed as the availability and equality of opportunities to access financial services. This is essential for fostering economic growth, reducing poverty, and addressing social inequalities (Demirgüç-Kunt Klapper, Singer, Ansar, & Hess, 2018). It empowers individuals and businesses to save securely, access credit, and manage financial risks, thereby contributing to personal and regional economic resilience. However, in developing economies like Nigeria, financial exclusion remains a persistent challenge, particularly among rural and low-income populations. The inability to access affordable financial services limits economic participation and deepens poverty, stalling both individual and national progress (World Bank, 2022).

Mobile money services, which enable financial transactions via mobile devices, have emerged as a transformative solution to address financial exclusion. By reducing transaction costs and eliminating the need for traditional banking infrastructure, mobile money has revolutionized access to financial services in various African countries (Jack & Suri, 2014). For instance, evidence from Kenya demonstrates that mobile money enhances economic resilience by providing affordable, reliable financial tools for underserved populations (GSMA, 2023). Despite these global successes, Nigeria's adoption of mobile money services remains uneven, with significant disparities across states. Regions like Kaduna State face unique socio-economic, cultural, and infrastructural challenges that hinder its widespread adoption and usage.

Kaduna State, located in northwestern Nigeria, is a diverse region characterized by both urban centres and remote rural areas. While urban communities have seen moderate growth in mobile money adoption, rural areas lag considerably due to infrastructural deficits, limited digital literacy, and socio-cultural resistance (EFInA, 2022). For example, network unreliability, the sparse distribution of agent banking services, and high transaction costs deter many rural residents from adopting mobile money (Okocha & Dogo, 2023). Furthermore, cultural norms and religious beliefs—particularly Islamic principles discouraging interest-based financial practices—further limit engagement with formal financial services (Muhammad, Ardo, Shariff, & Muhammed 2024). These barriers contribute to Kaduna's disproportionately high financial exclusion rate, leaving large portions of the population unable to access credit, save securely, or manage financial risks effectively (CBN, 2023).

Despite its potential, mobile money services have not fully addressed the financial inclusion gap in Kaduna State. Many individuals remain unbanked or under-banked, limiting their ability to participate in the formal

economy or leverage financial tools for personal and community development (World Bank, 2017). Addressing these issues requires a nuanced understanding of the demographic characteristics influencing mobile money usage, the barriers to adoption, and the overall impact of mobile money services on financial inclusion in Kaduna.

This study is justified by its potential to inform Nigeria's National Financial Inclusion Strategy, which targets a 95% inclusion rate by 2024 (CBN, 2023). By exploring the role of mobile money in Kaduna State and identifying specific barriers, the findings aim to guide policymakers and stakeholders in implementing effective interventions. The research also aligns with global objectives, such as the United Nations Sustainable Development Goals (SDGs), particularly Goal 1 (No Poverty) and Goal 8 (Decent Work and Economic Growth).

Mobile Money Services in Nigeria

Financial inclusion is critical for fostering economic growth and reducing poverty, particularly in regions with limited access to financial services like Kaduna State. Mobile money services have emerged as transformative tools to bridge financial exclusion gaps, offering accessible financial solutions to previously excluded populations (Demirgüç-Kunt et al., 2018). These services reduce transaction costs and extend financial services to rural and low-income groups, as demonstrated by successes in Kenya, where mobile money systems enhanced economic resilience and financial access (Jack & Suri, 2014). However, adoption in Nigeria remains inconsistent, especially in northern states like Kaduna, where unique socio-economic and cultural barriers persist (Akintola, 2024).

Barriers to financial inclusion in Kaduna include limited infrastructure, financial illiteracy, and cultural resistance. Studies highlight the region's poor mobile network coverage and limited agent banking services, which inhibit mobile money adoption in rural areas (Okocha & Dogo, 2023). Cultural and religious norms further complicate adoption, with Islamic principles discouraging interest-based financial practices posing significant challenges (Muhammad et al., 2024). These barriers highlight the need for targeted and culturally sensitive interventions to promote mobile money adoption.

Demographic and socio-economic factors also play crucial roles in financial inclusion. Education, income levels, and urban-rural divides significantly influence mobile money usage in Kaduna. Research indicates that younger populations and urban residents are more likely to adopt mobile money, while rural communities face greater challenges due to lower digital literacy and financial awareness (Aliyu et al., 2024; Yusuf et al., 2024). Women, in particular, face additional barriers but stand to benefit

significantly from mobile money through improved access to savings and credit (Yunus et al., 2023).

Mobile money's impact extends beyond financial access, contributing to economic empowerment and resilience. By enabling secure savings, access to credit, and entrepreneurial growth, mobile money supports economic participation among marginalized groups (Suri & Jack, 2016). However, infrastructural deficits and limited digital literacy remain significant barriers, underscoring the importance of expanding agent networks and digital education programs (GSMA, 2023). Despite these efforts, Nigeria's financial inclusion rates remain below expectations, highlighting gaps in policy implementation and infrastructural development (CBN, 2023; Famosaya, 2023).

While existing literature underscores the potential of mobile money for enhancing financial inclusion in Kaduna State, gaps remain in understanding its localized impact. Most studies focus on national or regional trends, leaving Kaduna's specific demographic and socio-cultural dynamics underexplored. Additionally, the role of gender, religion, and financial literacy in mobile money adoption requires further investigation. This study seeks to bridge these gaps by providing targeted insights into barriers, demographic influences, and the economic impact of mobile money on financial inclusion in Kaduna State.

Theoretical Framework

This study adopts the Technology Acceptance Model (TAM) as its theoretical framework to analyse the determinants of mobile money adoption and its impact on financial inclusion in Kaduna State. Developed by Davis (1989), TAM explains how individuals accept and use new technologies based on perceived usefulness (PU) and perceived ease of use (PEOU).

Perceived usefulness refers to the extent to which individuals believe that mobile money enhances their financial transactions and overall convenience. If users perceive mobile money as efficient, secure, and beneficial, they are more likely to adopt it (Agarwal & Gupta, 2024). Similarly, perceived ease of use describes how simple and accessible individuals find mobile money services. A user-friendly interface and well-established agent networks can significantly improve adoption rates, particularly in rural areas (Isiaku, Muhammad, & Oluwajana, 2024).

TAM is relevant to this study as it helps explain why education and income levels significantly influence mobile money adoption. Higher-income and more educated individuals may find mobile money services more useful and easier to use, while financial illiteracy and infrastructural challenges act as barriers to adoption (Alemu, 2024). Additionally, socio-

cultural factors and trust in digital transactions affect mobile money adoption, reinforcing the need for financial literacy programs and policy interventions.

Research Methodology

This study employs a multistage sampling technique, combining stratified sampling and random sampling to ensure a representative selection of respondents across Kaduna State. Given the geographical and socio-economic diversity within the state, this approach allows for a more structured and inclusive data collection process. To achieve representativeness, stratified sampling is used to divide Kaduna State into three distinct strata: Zone 1, zone 2 and zone 3. Stratified sampling is used to ensure representativeness by dividing Kaduna State into three distinct zones, capturing variations in financial inclusion and mobile money adoption across different settlement types. This method improves accuracy by dividing the population into homogeneous subgroups (strata) and then selecting samples randomly from each, minimizes selection bias, and enhances comparability by ensuring each zone is proportionally represented. Within each stratum, random sampling of two Local Government Areas (LGAs) ensures that each LGA has an equal probability of being included, enhancing the generalizability of findings to the entire state.

This method enables a balanced and systematic selection of respondents, improving the study's validity by reflecting variations in mobile money usage, access to financial services, and socio-economic conditions across different regions. By incorporating multiple stages of selection, the study effectively captures regional disparities while maintaining the rigor and reliability needed for meaningful analysis. Table 3.1 presents the population projection for each Local Government Area (LGA) in Kaduna State based on the 2006 census and projected to 2024 using a 2.55% annual growth rate.

Table 3.1: Kaduna LGA's 2006 population and 2024 projected population

S/N	LGA	2006 Population	Projected Population 2024
1.	Birnin Gwari	258,581	406,853
2.	Chikun	372,272	585,736
3.	Giwa	286,427	450,667
4.	Igabi	430,753	677,751
5.	Ikara	194,723	306,379
6.	Jaba	155,973	245,409
7.	Jema'a	278,202	437,725
8.	Kachia	252,568	397,393
9.	Kaduna North	364,575	573,626

10.	Kaduna South	402,731	633,661
11.	Kagarko	239,058	376,136
12.	Kajuru	110,868	174,440
13.	Kaura	174,626	274,758
14.	Kauru	221,276	348,157
15.	Kubau	282,045	443,772
16.	Kudan	138,956	218,634
17.	Lere	339,740	534,550
18.	Makarfi	146,574	230,621
19.	Sabon Gari	286,871	451,365
20.	Sanga	151,485	238,348
21.	Soba	291,173	458,134
22.	Zangon Kataf	318,991	501,903
23.	Zaria	408,198	642,262
	Total	6,113,503	9,619,048

Formula for Population Projection

$$P_t = P_o(1 + r)^t \hspace{4cm} 1$$

Where:

P_t = Projected population

P_0 = Population in the base year (2006 = 6,113,503)

r = Growth rate (estimated 2.55% per year)

t = Number of years from 2006 to 2022 (16 years)

Six local government were selected randomly, two from each senatorial district in the State. Using randomize control software, Zone one; Makarfi and Soba LGA's were selected, Zone two; Chikun and Kaduna north LGA's were selected and in zone three; Jemaá and Kachia LGA's.

S/N	LGA	Projected Population 2024	Sample size
1	Chikun	585,736	399
2.	Jema'a	437,725	399
3.	Kachia	397,393	399
4.	Kaduna North	573,626	399
5.	Makarfi	230,621	399
6.	Soba	458,134	399
	Total	2,683,235	2,394

The Yemani formula is commonly used to determine sample sizes in research but can also be adapted for population projections. The formula is given as:

$$n = \frac{N}{1 + N(e)}$$

n = Required population size or estimate
N = Total projected population
e = Margin of error (typically 5% or 0.05 in population studies)
This study employs a logistic regression model to examine the factors influencing mobile banking adoption and its impact on financial inclusion in Kaduna State, Nigeria. Logistic regression is suitable because the dependent variable (mobile banking usage) is binary (Yes = 1, No = 0). The model allows for analysing how demographic, socio-economic, and digital literacy factors affect the likelihood of mobile banking adoption, thereby providing insights into financial inclusion gaps.

The study employs a logistic regression model, which estimates the probability of mobile banking usage based on selected predictors. The logistic model is expressed as:

$$Logit(P) = In\left(\frac{P}{1-P}\right)$$
$$= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 (X_2 * X_3)$$
$$+ \epsilon \qquad 1$$

X_1= Age Group
X_2= Education Level
X_3= Log(Income Level)
X_4= Gender
X_5= Education×Log(Income) (Interaction Term)

Results and Discussions

This section presents the results of the logistic regression analysis conducted to examine the factors influencing mobile banking usage before the cashless policy. The analysis was performed using data from 2,100 respondents, with 80.8% reporting prior use of mobile banking and 19.2% reporting non-use. The logistic regression model included age group, log-transformed income level, education level, and an interaction term between education and income level to assess their influence on mobile banking usage.

The logistic regression model achieved a Pseudo R^2 of 0.25, indicating that education, income, and their interaction significantly explain mobile banking adoption. These insights can be used by the Kaduna State Government, banks, and telecom providers to design targeted interventions that address the specific barriers to financial inclusion in the state.

Table 4.1: Logistic Regression

Variable	Coefficient	SE	T-Start	P-value
Constant	0.9123	0.1847	4.937	0.0001
Age	-0.2104	0.1154	-1.823	0.0689
Log(Income)	0.5432	0.1031	5.270	0.0000
Education Level	0.8271	0.1745	4.740	0.0002
Education × Log(Income)	0.3421	0.0976	3.504	0.0006

The logistic regression analysis examined the factors influencing mobile banking usage. The model incorporated key predictors, including age group, income level (log-transformed), education level, and an interaction term between education and income. A total of 2,100 respondents participated in the survey. Education level emerged as a significant predictor of mobile banking usage (p=0.0002p). Respondents with tertiary education were significantly more likely to use mobile banking compared to those with only secondary education. The positive and significant coefficient for education (β=0.8271) suggests that individuals with higher educational attainment are more likely to adopt mobile banking services, possibly due to greater digital literacy and confidence in using technology for financial transactions.

The log-transformed income level showed a positive and significant relationship with mobile banking usage (β=0.5432, $p < 0.001$). This indicates that individuals with higher income levels are more likely to use mobile banking services. Higher-income earners may have greater access to smartphones, internet services, and multiple banking products that facilitate mobile banking usage. The study found that higher income levels increase mobile banking usage, but low-income earners in Kaduna State face barriers to financial services. According to the Kaduna State Development Plan (KSDP) 2021–2025, 65% of residents are low-income earners, particularly in rural LGAs, where poverty levels are high.

The interaction term between education and log-transformed income was significant (β=0.3421, p=0.0006), demonstrating that the effect of income on mobile banking usage was stronger among respondents with higher education levels. This suggests that income alone does not drive mobile banking usage; higher educational attainment amplifies the benefits of increased income, as educated individuals are more likely to understand and utilize digital financial services. The study found that the interaction between education and income levels significantly drives mobile banking adoption, highlighting that low-income individuals with digital skills are more likely to adopt digital financial services. In Kaduna State, this insight is crucial because high-earning artisans and traders in markets often lack digital literacy and rely on cash-based transactions, limiting their

participation in the digital economy. Educated low-income students and workers leverage mobile banking but lack tailored financial products.

The interaction term between education level and log-transformed income (β=0.3421, p=0.0006) was significant, indicating that the impact of income on mobile banking usage is stronger among individuals with higher education levels. This suggests that income alone may not drive mobile banking adoption unless individuals possess the educational background needed to understand and effectively use digital financial services.

The age group variable was not statistically significant, but the direction of the coefficients provides insight. Compared to youth (18–30 years), seniors (51+ years) were less likely to use mobile banking (β=−0.2104, p=0.0689) This may reflect technological barriers, limited digital literacy, or a preference for traditional banking methods among older respondents. Middle-aged individuals (31–50 years) exhibited varied behaviour but did not show a statistically significant difference from younger. The results indicated that older individuals are less likely to use mobile banking, which poses a risk of financial exclusion among older adults in Kaduna State, especially in rural LGAs where traditional banking methods are prevalent. Older traders and pensioners often lack trust in digital platforms due to concerns about fraud and cybercrime. In addition, seniors in rural areas face technological barriers, as USSD codes are often confusing.

Table 4.2: Multicollinearity

Predictor	VIF	Interpretation
Age Group	1.45	No multicollinearity ✔
Log(Income)	2.10	No multicollinearity ✔
Education Level	3.25	Low multicollinearity ✔
Education $\times$ Log(Income)	5.75	Moderate multicollinearity

Multicollinearity occurs when independent variables are highly correlated, causing unstable coefficients and misleading significance tests. The Variance Inflation Factor (VIF) helps identify this issue, with values above 5 indicating concern and above 10 signalling severe multicollinearity.

The VIF results for our predictors show minimal multicollinearity. Age Group (VIF = 1.45) and Log(Income) (VIF = 2.10) have low VIF values, indicating they are independent contributors to mobile banking usage. The Education Level (VIF = 3.25) shows slight correlation with income, which is expected since higher education often leads to higher income. However, this level of correlation remains acceptable, as education is a key predictor of technology adoption.

The interaction term (Education $\times$ Log(Income), VIF = 5.75) has moderate multicollinearity, which is typical for interaction terms. This term

is valuable for capturing how income impacts mobile banking differently based on education level. Despite the moderate VIF, the interaction term improves model fit and should be retained for theoretical reasons.

Conclusion and Recommendations

The findings from this study provide a clear roadmap for improving financial inclusion in Kaduna State through mobile banking. Addressing barriers such as low digital literacy, income disparities, and generational gaps can significantly expand access to financial services. By implementing targeted digital literacy programs, reducing cost barriers, and leveraging mobile technology, Kaduna State can advance its financial inclusion agenda, ensuring that no one is left behind in the transition to a cashless and inclusive digital economy. Hence, as a results the study recommends for digital financial literacy campaigns by targeted digital skills workshops in markets and schools and via partnership with NYSC (National Youth Service Corps) to use youth corps members as financial literacy ambassadors.

Affordable and Inclusive Financial Products by Kaduna Microfinance Bank should offer USSD-based savings products tailored to low-income earners. And commercial banks should partner with POS agents to expand mobile banking services in rural communities.

Inclusive Digital Platforms so that it should be user-friendly mobile banking apps in Hausa, focusing on USSD services for low-literate users and introduce voice-based banking services for individuals with low digital literacy.

Financial Incentives and Partnerships by providing subsidies for smartphones through Kaduna State SME loans to promote digital access and the telecom providers should offer free mobile banking data for Kaduna State social welfare beneficiaries.

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