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Digital Banking by Urban Refugees in Sub-saharan Africa: A Case of Kenya

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Abstract
Digital banking has become increasingly prevalent in Kenya in recent years. Kenya has experienced rapid growth in mobile phone ownership and usage, with over 90% of the population having access to mobile devices as of 2023. This high level of mobile penetration has created a favorable environment for the adoption of mobile-based financial services. The introduction of M-Pesa, a mobile money transfer and microfinancing service, in 2007 has been a significant driver of digital banking in Kenya. M-Pesa has become the dominant mobile money platform, with over 30 million active users as of 2022. This widespread adoption of mobile money has paved the way for further digital banking innovations. The Kenyan government and various financial institutions have prioritized financial inclusion as a key development goal. Initiatives such as the National Financial Inclusion Strategy have aimed to increase access to formal financial services, particularly in rural and underserved areas. Digital banking solutions have been instrumental in achieving these financial inclusion objectives. Refugees in Kenya face significant challenges in accessing digital banking platforms, despite the overall growth and adoption of digital banking in the country. Many refugees in Kenya lack official identification documents, such as national ID cards or passports, which are often required to open a bank account or register for digital banking services. This lack of formal identification creates barriers to accessing formal financial services. This study investigated the utilization of digital banking services by urban refugees in Kenya. The objective of the study was to determine the impact of CBO membership, SIM Card ownership, Refugee ID Cards, and other socioeconomic variables on digital mobile banking. The estimates were regressed using the logistic regression and marginal effects analysis conducted. The study found that access to SIM cards, Refugee cards, and mobile banking positively impacted the utilization of digital mobile banking services. The study also found that participation in community-based organizations positively impacts the utilization of digital banking. The study concludes with recommendations to the government of Kenya to put in place measures to ensure timely issuance of refugee cards to refugees to ease their access to SIM Cards for easier utilization of digital banking services.

Keywords: Digital Banking, Refugees, Financial Services

JEL Classification: O31,032&03

Introduction

Digital banking has become increasingly prevalent in Kenya in recent years. This trend can be attributed to several factors. Mobile Phone Penetration in Kenya has experienced rapid growth in mobile phone ownership and usage, with over 90% of the population having access to mobile devices as of 2023 (Communications Authority of Kenya, 2023) [15]. This high level of mobile penetration has created a favorable environment for the adoption of mobile-based financial services. M-Pesa and the Growth of Mobile Money has been noted to increase accessibility to digital banking. The introduction of M-Pesa, a mobile money transfer and microfinancing service, in 2007 has been a significant driver of digital banking in Kenya (Jack and Suri, 2011) [39]. M-Pesa has become the dominant mobile money platform, with over 30 million active users as of 2022 (Safaricom, 2022) [70]. This widespread adoption of mobile money has paved the way for further digital banking innovations.

Financial Inclusion Initiatives by the Kenyan government and various financial institutions have prioritized financial inclusion as a key development goal. Initiatives such as the National Financial Inclusion Strategy have aimed to increase access to formal financial services, particularly in rural and underserved areas (Central Bank of Kenya, 2018) [13]. Digital banking solutions have been instrumental in achieving these financial inclusion objectives. Regulatory Frameworks by the Central

Bank of Kenya (CBK) have provided a supportive regulatory environment for digital financial services, including mobile money and digital banking (GSMA, 2022) [35] This has provided a stable and enabling framework for the growth of the digital banking ecosystem in the country. Increased smartphone adoption rise and smartphone ownership in Kenya, driven by the availability of affordable devices and improved mobile internet connectivity, has further facilitated the adoption of digital banking applications and services (GSMA, 2022) [35]. These factors have collectively contributed to the widespread utilization of digital banking in Kenya. Kenyan consumers have embraced digital banking solutions, which offer convenience, accessibility, and financial empowerment, particularly for the unbanked and underserved populations.

Moreover, the utilization of digital services has been plagued with several cyber security and scam incidences limiting and discouraging access and utilization of digital services. In 2021, a widespread scam targeted MTN Mobile Money users across several African countries, including Nigeria, South Africa, and Uganda (MTN Group, 2021) [55]. Scammers would call victims pretending to be from MTN and trick them into disclosing their mobile money PIN, leading to the theft of funds from their accounts. Thousands of users were reported to have lost money, with estimates of losses reaching millions of dollars. Business Email Compromise (BEC) scams have also been a persistent issue in Kenya, with cybercriminals impersonating company executives or suppliers to defraud businesses. In 2019, a Kenyan company lost over $1 million after falling victim to a BEC scam, where the attackers diverted payment to a fraudulent account (Business Daily, 2019). These types of scams have continued to plague Kenyan businesses, leading to significant financial losses (Mutua, 2019) [56].

Cybercriminals in South Africa have targeted mobile banking users, leveraging techniques like SIM swapping and phishing to gain unauthorized access to accounts. In 2020, the South African Banking Risk Information Centre reported that mobile banking fraud had increased by over 100% compared to the previous year (South African Banking Risk Information Centre, 2020) [75]. Nigeria has seen a rise in cryptocurrency-related scams, with cybercriminals exploiting the growing interest in digital currencies (Obiezu, 2021) [58]. In 2021, a Ponzi scheme called the "Wisemen Cash Club" collapsed, leaving thousands of Nigerian investors with significant losses Other common crypto scams in Nigeria include fake investment platforms, phishing attacks, and impersonation of well-known crypto figures (Voice of America, 2021) [84]. Ransomware has been a growing threat in several African countries, affecting both individuals and organizations. In 2020, the Ugandan Ministry of Health was hit by a ransomware attack, leading to the disruption of healthcare services and the potential compromise of sensitive data (Al Jazeera, 2020) [2]. Similar ransomware incidents have been reported in other African nations, such as South Africa, Nigeria, and Kenya, causing financial losses and business disruptions (Olukoya, 2020) [60].

Despite the challenges and risks associated with digital adoption and utilization, a huge proportion of the population still seeks to access digital services but faces many challenges. Refugees in Kenya face significant challenges in accessing digital banking platforms, despite the overall growth and adoption of digital banking in the country. Refugees in Kenya lack identification documents such as national ID cards or passports, which are often required to open a bank account or register for digital banking services (Aaron, 2018) [1]. This lack of formal identification creates barriers to accessing formal financial services. Refugees in Kenya are characterized by limited financial literacy. Refugee populations may have a limited understanding of digital banking and financial services, making it difficult for them to navigate and utilize these platforms effectively (Zollmann, 2014) [86]. Targeted financial education and training programs are often lacking.

Language and Cultural Barriers between urban refugees and host communities were noted to be a barrier to digital inclusion among urban refugees in Kenya (Dupas *et al*., 2018) [23]. Digital banking platforms and associated documentation are often available only in the official languages of Kenya, such as English and Swahili. Refugees from diverse linguistic and cultural backgrounds often face challenges in comprehending and using these services. Furthermore, refugees, particularly those in remote or underserved areas, may have limited access to the necessary technological infrastructure, such as smartphones, mobile internet, and electricity, required to utilize digital banking platforms (GSMA, 2019) [34]. This digital divide hinders their ability to engage with these services.

The majority of refugees are often hesitant to use digital banking platforms due to concerns about data privacy, cybersecurity, and the overall trustworthiness of these services, especially if they have experienced financial exploitation or insecurity in the past (Suri & Jack, 2016) [77]. Refugees also lack the necessary credit history and documentation required by financial institutions to access certain digital banking services, such as loans or credit facilities (Demirgüç-Kunt *et al*., 2018) [19]. This can limit their financial inclusion and ability to build financial resilience. To address these challenges, a collaborative effort involving the government, financial institutions, and humanitarian organizations is needed to develop targeted interventions and innovative solutions that cater to the specific needs of refugee populations in Kenya. This may include initiatives such as alternative identification mechanisms, financial literacy programs, multilingual platform interfaces, and tailored digital banking products and services (Golden & Cordie, 2022) [31].

Despite challenges and risks involving digital banking services, digital banking has improved socioeconomic outcomes for societies in least developed economies. Digital banking platforms, such as mobile money services, have reached individuals in remote and underserved areas, allowing users to access basic financial services like savings, payments, and money transfers (Demirgüç-Kunt *et al*., 2018) [19]. This is particularly beneficial for marginalized groups, including women, refugees, and the poor, who may face barriers to accessing traditional financial services (Ozili, 2018) [62]. Digital banking data, such as mobile money transaction histories and mobile airtime credit, has also been used to assess the creditworthiness of individuals and small businesses, enabling access to formal credit without traditional collateral requirements (Ozili, 2018) [62]. This can help spur entrepreneurship and support the growth of small and medium-sized enterprises, which are crucial for economic development in poor nations (Ozili, 2018) [62]. Digital banking services have been found to lower the cost of financial transactions, such as money transfers and bill

payments, compared to traditional banking methods, which often involve high fees and travel expenses (Ozili, 2018) [62]. This cost savings can be particularly beneficial for low-income individuals and households, making financial services more affordable and accessible.

Mobile banking and digital financial services allow individuals to conduct transactions, access account information, and make payments from the convenience of their mobile devices, eliminating the need for physical branch visits (Shaikh & Karjaluoto, 2015) [73]. This can be especially important in areas with limited transportation infrastructure or where physical bank branches are scarce (Shaikh & Karjaluoto, 2015) [73]. Furthermore, digital banking platforms can integrate educational resources and tools to help users better understand financial concepts, budgeting, and money management (Ozili, 2018) [62]. This knowledge is important as it improves financial literacy and empowers individuals to make more informed decisions, save more effectively, and better manage their finances (Ozili, 2018) [62].

Problem Statement

Urban refugees face significant barriers to accessing and utilizing digital banking services in their host countries. Existing research has identified various problems that impede refugees' ability to engage with digital financial tools, including lack of identification documents, limited digital literacy, language barriers, unstable internet connectivity, mistrust of financial institutions, lack of financial education, affordability concerns, and accessibility challenges (Betts *et al*., 2017; Donovan & Park, 2019; Okundaye *et al*., 2019) [9, 22, 59].

Refugees often flee their home countries without proper identification documents like passports, national IDs, or birth certificates (Betts *et al*., 2017) [9]. Digital banking services typically require these documents for account creation and authentication, which poses a major barrier for refugees (Staton, 2020) [76]. Lack of official identification makes it difficult for refugees to prove their identity and establish financial accounts. Many refugees, especially those from rural or underdeveloped areas, have limited experience with technology and digital interfaces (Donovan & Park, 2019) [22]. Navigating complex banking apps and websites can be challenging for those unfamiliar with digital tools (Okundaye *et al*., 2019) [59]. This digital literacy gap hinders refugees' ability to effectively utilize digital banking services.

Digital banking services are often only available in the dominant languages of the host country, which may differ from the native languages of refugees (Donovan & Park, 2019) [22]. The linguistic mismatch makes it difficult for refugees to understand and use these services, limiting their access and engagement (UNHCR, 2021) [81]. Urban refugees may also reside in areas with unreliable or limited internet access, making it challenging to consistently access digital banking services that require a stable internet connection (Donovan & Park, 2019) [22]. The majority of refugees also mistrust financial institutions. Refugees from countries with unstable financial systems or histories of government corruption may be hesitant to trust local financial institutions and digital banking services (Betts *et al*., 2017) [9]. This lack of trust can hinder refugees' willingness to adopt and use digital banking tools.

These barriers can have far-reaching consequences for refugees, limiting their ability to securely store their savings, send and receive remittances, and access other essential financial services that could support their integration and economic well-being in the host country (Staton, 2020; UNHCR, 2021) [76, 81]. Addressing these problems is crucial for promoting financial inclusion and empowering refugees to achieve self-reliance and economic stability.

Research Objectives

The general objective of the study is to determine the impact of smartphone ownership on inclusion in digital banking among urban refugees in Kenya.

The specific objective of the study is to;

1. Determine if ownership of SIM cards, refugee cards, and smartphones by urban refugees influences digital banking.
2. Analyze the role of remittances from friends and family abroad on the utilization of digital banking
3. Determine the impact of membership in community-based organizations (CBOs) on digital banking.
4. Investigate the impact of having nuclear members abroad or in Kenya on the adoption of digital banking services.

Hypothesis testing

Hypothesis testing was conducted to prove or dispel beliefs on the impact of specific explanatory variables on digital banking.

$H_0$1 Having a nuclear member abroad or in Kenya has no statistical significance on the utilization of digital banking by Urban refugees

H_a1 Having a nuclear member abroad or in Kenya has a statistical significance on the utilization of digital banking by Urban refugees

H_0 2 Member of a community-based organization has a statistical significance on utilization of digital banking by Urban refugees

H_A 2 Member of a community-based organization has no statistical significance on utilization of digital banking by Urban refugees

H_0 3 Owning a Smart Phone has a statistical significance on the utilization of digital banking by Urban refugees

H_A 3 Owning a Smart Phone has no statistical significance on the utilization of digital banking by Urban refugees.

Literature review

Theoretical Literature

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a widely recognized theoretical framework that explains an individual's acceptance and use of new information technology. Developed by Fred Davis in 1989, TAM posits that an individual's intention to use technology is primarily determined by two key factors: Perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which an individual believes that using a particular technology or system will enhance their performance or provide benefits. In the context of digital banking, perceived usefulness can include factors such as improved financial management and control, faster and more convenient access

to banking services, enhanced ability to monitor account balances and transactions, and reduced time and effort required for routine banking tasks. If customers perceive digital banking services as useful in improving their financial well-being and productivity, they will be more inclined to adopt and utilize these services.

Perceived ease of use refers to the degree to which an individual believes that using a particular technology or system will be free of effort. For digital banking, perceived ease of use can encompass factors such as:

- Intuitive and user-friendly interface design
- Seamless navigation and task completion
- Availability of clear instructions and support resources
- Minimal technical expertise required to use the digital banking platform.

According to this theory, if customers perceive digital banking services as easy to use, they will be more likely to overcome any initial resistance or hesitation to adopt these services. Furthermore, TAM suggests that external factors, such as system characteristics, user characteristics, and organizational factors, can indirectly influence the adoption and utilization of digital banking services by affecting the perceived usefulness and perceived ease of use.

Network Effects Theory

According to this theory, direct network effects occur when the value of a product or service increases for a user as more users join the network (Katz & Shapiro, 1985) [42]. In the case of digital banking, as more customers use the same online or mobile banking platform, the value of the platform increases for each user. This is because they can benefit from features such as:

- Ability to easily transfer funds or make payments to other users on the same platform
- Increased opportunities for peer-to-peer transactions and financial collaborations
- Access to a larger pool of financial data and insights shared by the growing user base.

Indirect network effects arise when the value of a product or service increases due to the availability of complementary products or services (Eisenmann *et al*., 2006) [25]. For digital banking, indirect network effects can be observed in the growing ecosystem of financial apps, digital wallets, and other fintech services that integrate with the core banking platform. As more third-party providers develop complementary services and tools that seamlessly integrate with the digital banking platform, the overall value proposition for the users increases, further driving adoption and usage. The network effects theory suggests that as more users join a digital banking platform, the value of the platform increases, attracting even more users, and creating a positive feedback loop (Evans & Schmalensee, 2016) [26]. Positive feedback loops can emerge, where increased adoption leads to more features, integrations, and a richer ecosystem, which in turn attracts more users. Financial institutions can harness network effects by:

- Integrating digital banking with popular financial apps and services.
- Encouraging customer referrals and word-of-mouth through incentives.
- Developing a robust digital banking ecosystem with third-party partnerships and APIs.
- Continuously adding new features and functionalities to enhance the value proposition for users.

Empirical Literature

Several empirical studies have explored the key determinants of digital banking adoption and usage. Shaikh and Karjaluoto (2015) [73] conducted a comprehensive review of the literature on mobile banking adoption, identifying factors such as perceived usefulness, ease of use, trust, and social influence as significant predictors. Similarly, Alalwan *et al*. (2016) [4] found that performance expectancy, effort expectancy, social influence, and facilitating conditions were important determinants of intention to use Internet banking. A study by Alalwan *et al*. (2017) [3] in Kenya found that performance expectancy, effort expectancy, social influence, and facilitating conditions were significant predictors of digital banking adoption. Kanimozhi and Devi (2020) [41] identified that perceived usefulness, perceived ease of use, and trust were critical drivers of digital banking acceptance in Ghana. Onyia and Ikemelu (2015) [61] in their study on digital banking utilization in Nigeria noted that mobile network quality, perceived risk, and regulatory support were major determinants of digital banking usage in Nigeria.

Examining the role of demographic characteristics, Laukkanen and Pasanen (2008) [46] observed that age, income, and education level were significant factors influencing the utilization of online banking services. Younger, higher-income, and more educated consumers were more likely to adopt and use digital banking platforms. Additionally, Dapp (2014) [17] highlighted the importance of digital literacy and technology acceptance in driving the adoption of mobile banking among specific consumer segments. Thulani *et al*. (2014) observed that younger, higher-income, and more educated consumers were more likely to adopt digital banking services in Zimbabwe. Authors such as Kumari and Khanna (2017) [45] found that gender and age had a significant influence on digital banking usage patterns in South Africa, with younger and male consumers being more active users.

Several studies have also explored the relationship between customer satisfaction and the utilization of digital banking. Groening *et al*. (2019) [32] found that customer satisfaction with digital banking services was positively associated with increased usage, suggesting that providing a positive user experience can foster long-term engagement and loyalty. A study by Chinomona and Sandada (2013) [14] in South Africa revealed that system quality, information quality, and service quality were positively associated with customer satisfaction and continuance intention in digital banking. Marakanon and Panjakajornsak (2017) [50] nevertheless highlighted that website design, reliability, and responsiveness were key determinants of customer satisfaction and loyalty in digital banking in Kenya.

The impact of trust and security on digital banking adoption has also been a prominent area of research. Gu *et al*. (2009) [36] demonstrated that perceived security and trust in the banking institution were key determinants of intention to use Internet banking. Embracing robust security measures and cultivating trust among customers can significantly influence the adoption and continued use of digital banking platforms (Martins *et al*., 2014) [51]. Maduku (2016) [47] found that perceived security and trust were significant predictors of digital banking adoption in South Africa,

emphasizing the importance of addressing consumer concerns. Auta (2010) [8] identified that lack of trust in the banking system and perceived risks were major barriers to digital banking usage in Nigeria.

Furthermore, the integration of emerging technologies, such as biometrics and artificial intelligence, has been shown to enhance the utilization of digital banking services. Researchers have highlighted the potential of these technological advancements to improve user experience, security, and personalization, leading to increased customer engagement and loyalty (Mokhtarian & Salimi, 2021; Ngai & Gunasekaran, 2007) [53, 57]. Empirical research has widely been done globally on emerging technologies and Digital banking utilization. A study by Morosan and DeFranco (2016) [54] found that the integration of biometric authentication (e.g., fingerprint, facial recognition) in mobile banking significantly improved perceived security and trust, leading to increased user adoption and continued usage. Tassabehji and Kamala (2012) [78] also observed that biometric identification, such as voice recognition, increased customer confidence in the security of digital banking services, which positively influenced their intention to use these platforms. Rathod and Kushwaha (2018) [66] reported that the implementation of biometric authentication in Indian digital banking reduced instances of fraud and improved customer satisfaction, contributing to higher utilization rates.

On artificial intelligence integration, Puschmann (2017) [64] found that the integration of AI-powered chatbots and virtual assistants in digital banking enhanced the user experience by providing personalized support, faster problem resolution, and 24/7 accessibility, leading to increased customer engagement. Maedche *et al*. (2019) [48] noted that the use of AI-driven predictive analytics and personalization features in digital banking platforms improved customer segmentation, customized product recommendations, and anticipation of user needs, resulting in higher customer satisfaction and loyalty. Pal *et al*. (2020) [63] observed that AI-powered fraud detection and risk management systems in digital banking effectively identified and mitigated suspicious activities, which contributed to increased trust and utilization of these services.

Methodology

Numerous empirical studies have validated the UTAUT model in various digital service contexts in Mobile banking Foon and Fah (2011) [28] applied the UTAUT model to investigate the adoption of mobile banking services in Malaysia, and their results supported the influence of performance expectancy, effort expectancy, and social impact on behavioral intention.

Theoretical Framework

The Unified Theory of Acceptance and Use Theory (UTAUT) model was developed by Venkatesh *et al*. (2003) [83] as a comprehensive framework for understanding the adoption and use of information technologies. The model integrates elements from various prominent technology acceptance theories, such as the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behavior (TPB), the Combined TAM and TPB (C-TAM-TPB), the Model of PC Utilization (MPCU), the Innovation Diffusion Theory (IDT), and the Social Cognitive Theory (SCT).

According to the model:

Behavioral Intention (BI) = f (Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions)

Use Behavior = f (BI, Facilitating Conditions).

1. **Performance Expectancy:** The degree to which an individual believes that using the system will help them attain gains in job performance. E.g. Digital banking improves ease of deposit and withdrawal of cash
2. **Effort Expectancy:** The degree of ease associated with the use of the system. E.g. Does digital banking require access to Internet services
3. **Social Influence:** The extent to which an individual perceives that important others believe they should use the new system.
4. **Facilitating Conditions:** The degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system.

Regression model

Logistic Regression Model

The four objectives of the study were analyzed using the logistic regression model. In incidences where urban refugees utilized digital banking, the dependent variable was allocated the dummy value of 1, and a value of 0 was allocated for non-use. Log odds and independent variable linearity are assumed in logistic regression. The study's dependent variable is binary therefore the covariate values were pooled and transformed into a probability scale with a range of 0 to 1. The dependent variable W is expressed as a non-linear function of the explanatory variable X in the logit analysis, which is an extension of the linear probability regression model.

$$W = f(x)$$

The general linear regression model is often expressed as follows:

$$W_i = \beta_0 + \beta_i X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + \varepsilon_i$$

Where;

β_0 is the intercept or constant

β_i 's is the slope between W_i and the X_i that is needed

$\mathcal{E}$ is the error term

Given the independent variables in the model, the linear equation above is interpreted as the probability that an urban refugee utilizes digital banking services or not. The model can be simplified as:

$$Log\left(\frac{P_i}{1-P_i}\right) = Logit(P_i) = \beta_0 + \beta_i\, x + \varepsilon$$

Where X represents all the explanatory variables in the study.

In the study P_i is the probability of utilizing digital banking services. Therefore, the parameter β_0 will show the log odds of an urban refugee using digital banking services (when $x = 0$) and β_1 shows how these odds differ (when $x = 1$) when an urban refugee is not utilizing digital banking services. The model can be illustrated in terms of odds as follows: $\left(\frac{P_i}{1-P_i}\right) = = exp\ (\beta_0 + \beta_i x)$ or in terms of the

probability of the outcome as: $P_i = exp(\beta_0 + \beta_1 X)/(1 + exp\ exp\ (\beta_0 + \beta_1 X))$.

Research Sample

The sample for this study consisted of 2403 urban refugee households sampled from Nairobi, Mombasa, and Nakuru. The households under study consisted of members between 1 and 12. The majority of urban refugee households resided in Nairobi. The study sample had 52.95% of refugee households residing in Nairobi, 30.02% in Mombasa 16.86% in Nakuru, and 0.16% from other parts of the country and around the world. Regarding the gender of household heads, 54.39% of households were headed by a male while 45.61% of households were headed by females. The refugee households sampled had 55.66% of households utilizing Mpesa, Mshwari, and digital banking services. With regards to integration to the host communities, 58.29% of urban refugees needed refugee cards while 41.71% already had refugee cards.

Research design

The study employed a cross-sectional research design using secondary data to investigate patterns and trends in digital technology utilization among urban refugees in Kenya. The data for this study were obtained from the United Nations High Commission for Refugees (UNHCR) a nationally representative survey conducted annually by the UNHCR. The UNHCR collects detailed information on household ownership and usage of various digital technologies, including computers, smartphones, internet access, and online activities. The most recent UNHCR data, collected in 2021, was used for this analysis. The independent variables of interest included ownership of smartphones, receiving remittances, having a nuclear family abroad or in Kenya, owning a bank account, et cetera. The dependent variables measured various aspects of digital technology utilization such as utilization of digital banking services. Descriptive statistics were used to examine the distribution of digital technology utilization across different demographic and socioeconomic groups. Chi-square tests and one-way ANOVA were conducted to assess the statistical significance of differences in digital technology usage patterns. A logistic regression analysis was then used to model the relationships between the independent variables and the digital technology utilization outcomes while controlling for potential confounding factors.

Research analysis

The raw UNHCR 2021 dataset was imported into Stata. The variables of interest were identified and selected for the analysis. Missing values were examined, and appropriate handling strategies were determined (e.g., listwise deletion, imputation). The dataset was then cleaned and formatted to ensure consistency and accuracy.

Descriptive statistics, including frequencies, means, and standard deviations, were calculated to provide an overview of the sample characteristics and the distribution of digital technology utilization measures. These descriptive analyses were conducted for the full sample and stratified by the independent variables. Chi-square tests and one-way ANOVA were used to examine the bivariate relationships between the independent variables (demographic and socioeconomic characteristics) and the digital technology utilization outcomes. These analyses helped identify significant differences in technology usage patterns across different households.

Logistic regression models were estimated to assess the independent effects of the demographic and socioeconomic variables on digital technology utilization outcomes while controlling for potential confounding factors. To ensure the robustness of the findings, various sensitivity analyses were performed, including the examination of alternative model specifications, the use of different estimation techniques (e.g. Pearson correlation, Sktest, Cronbach alpha), and the assessment of potential interactions between the independent variables. The statistical analyses were accompanied by the appropriate use of statistical assumptions, diagnostics, and post-estimation tests to ensure the validity and reliability of the results. All analyses were conducted at a significance level of $p < 0.1$, and effect sizes were reported to quantify the magnitude of the observed relationships.

Results and Discussion

Table 1: Descriptive statistics

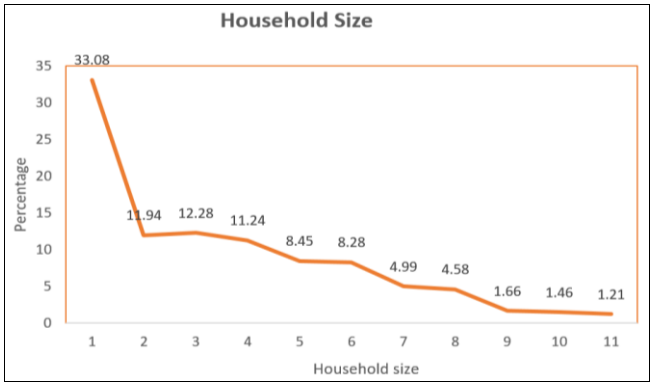
Variable	Obs	Mean	Std. Dev.	Min	Max
Utilization of digital banking	2,438	0.556604	0.496888	0	1
Household Size	2,403	3.550562	2.653498	1	12
Number of Assets	2,438	5.205086	2.098073	0	15
Ownership of Smartphone	2,438	0.687859	0.463462	0	1
Having Nuclear member Abroad	2,438	0.263741	0.440751	0	1
Having Nuclear members in Kenya	2,438	0.222724	0.41616	0	1
Receive Remittances	2,438	0.3105	0.462793	0	1
Own bank account	2,438	0.079573	0.270687	0	1
Got Mobile banking	2,438	0.817063	0.386694	0	1
Engaged in Village/Community Savings and Loans Associations	2,438	0.009844	0.098748	0	1
In need of a Refugee ID	2,438	0.582855	0.493189	0	1
Sim card Ownership	2,438	0.209598	0.407105	0	1
Membership of CBO	2,438	0.074241	0.262217	0	1
Food Insecurity	2,438	0.731747	0.443141	0	1

Source: Authors' own computation

The average urban refugee household size was 4 members with the largest household having 12 members and the least having one member. Refugee households were either utilizing digital services or not with the majority of the variables represented in dummy form for the sake of analysis. Concerning household assets, a refugee household had on average 5 assets with the richest household owning 15 assets while the poorest had no assets. Assets owned in this case range from radios, television sets, Sate light dishes, smartphones, refrigerators, cars, bicycles et cetera. The refugee households were such that other households were members of community-based organizations or were engaged in community savings and loan associations while others were not.

Demographic Analysis

a) Household size



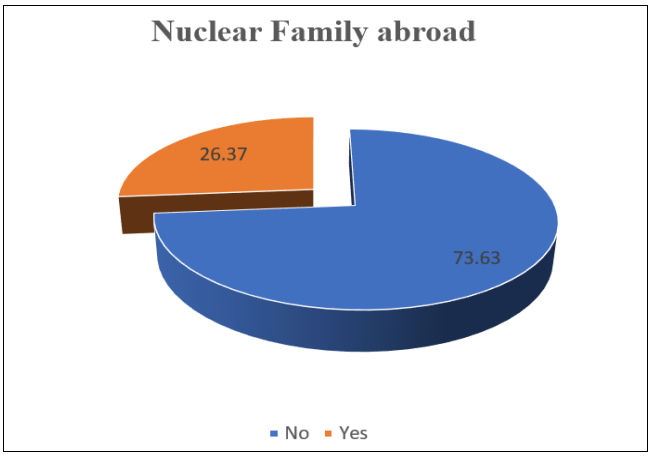
Source: Authors' Own computation

Fig 1: Household size

The study found that the majority of urban refugee households had about 3 members. The study further noted that 11.94% of the households had 2 members, while 1.21%of refugee households had over 11 members. With the average household size being recorded at 3.55 members, over 95% of households had members above the sample average.

b) Nuclear Family Abroad

The study further noted that 73.63% of urban refugees had no nuclear family members living abroad as shown in Fig 2 below. The study further revealed that while 31.05% of refugees received remittances from abroad, 68.95% received no remittances. Further analysis also shows that 22.27% of urban refugees had no friends or relatives in other parts of Kenya. Households without family members abroad have less direct incentive or obligation to send money back home (Amuedo-Dorantes *et al*., 2006) [6] The primary motivation for international remittances is often to support family members in the country of origin. Dustmann & Mestres (2010) [24] noted that without close relatives or dependents living in another country, these households may be less likely to engage in the practice of sending remittances. Even if households without family abroad do send some remittances, the amounts are likely to be significantly lower compared to households with family members abroad. The remittance amounts are often tied to the needs and financial circumstances of the recipient households. Without direct family ties, the need for financial support may be less urgent or compelling.

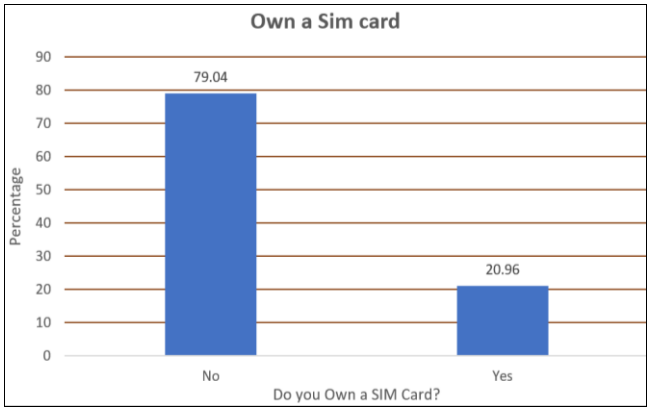


Source: Authors' Own computation

Fig 2: Nuclear Family Abroad

c) Ownership of SIM Cards

Owning a SIM card can be very beneficial for engaging in digital banking activities. A SIM card allows you to access your bank account and perform various banking transactions through your mobile device (Siddik *et al*., 2019) [74]. With a SIM card, you can log into your mobile banking app and check account balances, transfer funds and pay bills. Many banks use SMS-based two-factor authentication (2FA) to verify your identity and authorize transactions. The SIM card enables you to receive one-time passwords or verification codes sent via SMS, which is an important security measure for digital banking. SIM cards can be integrated with mobile wallets, allowing you to store your debit/credit card information and make secure contactless payments using your smartphone. This enables you to use your phone for in-person, online, and in-app purchases, reducing the need to carry physical cards (Donner & Tellez, 2008) [20]. In some regions, SIM cards are used to access mobile money services, which allow you to store, transfer, and withdraw funds directly from your mobile device. These services can be particularly useful in areas with limited access to traditional banking infrastructure (Jack & Suri 2014) [40]. The study however noted that over 79% of urban refugee households had no access to SIM Cards as shown in Fig 3, further deepening digital exclusion among these households.



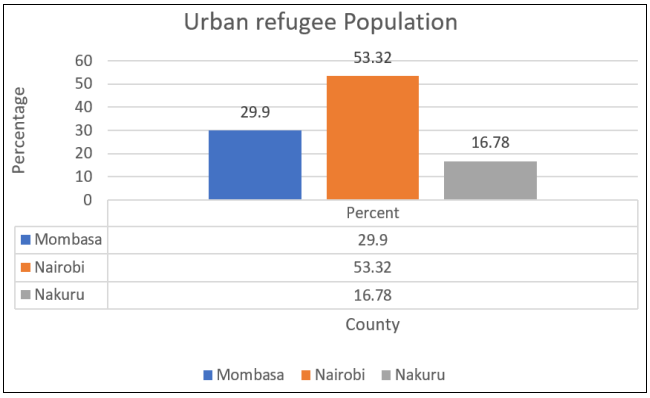
Source: Authors own computation

Fig 3: Ownership of SIM cards

The study also revealed that less than 10% of urban refugees were members of a community-based organization. Furthermore, 81.71% were engaged in mobile banking while 18.29% used other forms of banking services. It was also noted that 92.04% of urban refugee households had no bank account or SACCO account and 31.21% of households had no smartphone.

d) Urban refugee population

According to this UNHCR report, as of August 2023, the majority of registered refugees and asylum-seekers in Kenya, approximately 55.3%, are from Somalia (UNHCR, 2023). Somalia has experienced protracted political instability, civil war, and armed conflicts since the collapse of the Somali government in the early 1990s (Menkhaus, 2017) [52]. Ongoing violence, clashes between government forces and al-Shabaab militants, and the lack of a stable central government have forced many Somalis to flee the country as refugees (Bryden, 2013) [11]. Somalia has also been plagued by recurring droughts and famines, which have exacerbated the humanitarian crisis and led to widespread displacement (Majid, & McDowell, 2012) [49]. The combination of conflict and environmental disasters has made it increasingly difficult for many Somalis to sustain their livelihoods, driving them to seek refuge in neighboring countries like Kenya. Crisp (2010) [16] noted that Kenya, being a neighboring country, has historically been a key destination for Somali refugees due to its relative proximity and the presence of established refugee camps. The Dadaab refugee complex in northeastern Kenya, for example, has hosted Somali refugees since the early 1990s and remains one of the largest refugee settlements in the world. Some refugees however leave the camps (legally or illegally) and settle in major towns in Kenya. The study noted that over 80% of urban refugees resided in Nairobi and Mombasa as shown in Fig 4 below while the rest were distributed in other towns.



Source: Authors Own Computation

Fig 4: Urban refugee population

Drivers of Digital Banking among Urban Refugees in Kenya

The estimates found that a unit increase in asset ownership, increased the households' odds of utilization of digital banking services by 1.16938 holding other factors in the model constant. These results corroborate findings by authors who analyzed the relationship between mobile money, digital inclusion, and wealth. - Research has shown that households with higher levels of asset ownership, such as property, vehicles, livestock, etc., are more likely to use digital banking services (Donovan, 2012) [21]. Asset ownership can be seen as a proxy for household wealth and financial capacity, which enables and incentivizes the use of digital financial tools (Demirgüç-Kunt *et al.*, 2018) [19] Salampasis & Mention (2018) [72] also noted that wealthier households may have better access to digital devices, internet connectivity, and financial literacy required to utilize digital banking. Higher asset ownership therefore signals financial stability and creditworthiness, which can improve access to digital banking products and services.

The estimates found having an additional nuclear family member in Kenya, increased the households' odds of utilization of digital banking services by 0.63759 holding other factors in the model constant. These findings corroborate findings by researchers such as Ozil who studied the impact of digital finance on financial inclusion. In his study, Ozil found that having a family member who utilizes digital services increases the probability that a household will also use digital banking services. Research has shown that the adoption and use of digital financial services, such as mobile banking, online banking, etc., can be strongly influenced by the behavior and usage patterns of family members and peers (Ozili, 2018) [62]. If a household has a member who already uses digital services, this can positively impact the likelihood of other household members also utilizing digital banking tools (Reeves & Sabharwal, 2013) [67].

The estimates also found that an additional household member utilizing mobile banking, increased the households' odds of utilization of digital banking services by 28.68742 holding other factors in the model constant. These findings corroborate findings by researchers who have noted that observing and learning from the experiences of family members who use digital services can reduce the perceived complexity and uncertainty associated with adopting these technologies (Venkatesh & Davis, 2000) [82]. Family members may provide support, advice, and assistance in navigating and using digital banking platforms, lowering the barriers to adoption (Rogers, 2010) [68]. A household member's positive experience with digital services can create trust and familiarity, encouraging other household members to try these services as well (Kiygi-Calli, 2016) [44]. The estimates found that having an additional household member engage in Village/Community Savings and Loans Associations increased the households' odds of utilization of digital banking services by 0.07156 holding other factors in the model constant. Strategies to promote digital financial inclusion should consider the role of social networks and family influences in driving the adoption of these services (Fernandes *et al.*, 2014) [27]. Initiatives that leverage peer-to-peer learning and community-based approaches may be more effective in increasing digital banking usage, compared to top-down approaches (Gabor & Brooks, 2017) [29]. Understanding the dynamics of how digital service usage spreads within households and communities can inform the design of more targeted and impactful financial inclusion programs (Sahay *et al.*, 2015) [71].

The estimates further found having an additional member with a refugee ID, increased the households' odds of utilizing digital banking services by 1.85221 holding other factors in the model constant. These results corroborate findings by authors such as Demirgüç-Kunt *et al.* who noted that lack of official identification is a significant barrier to digital and financial inclusion, particularly for marginalized

groups such as the poor, migrants, and women (Demirgüç-Kunt *et al*., 2018) [19]. The impact of identification cards (ID cards) and SIM cards on digital inclusion is an important consideration in the context of increasing financial and digital access for underserved populations. ID cards are a fundamental requirement for accessing many digital services, including opening bank accounts, accessing government welfare programs, and obtaining mobile phone subscriptions (Gelb & Metz, 2018) [30].

The estimates further found having an additional member with a SIM Card, increased the odds of utilization of digital banking services by a household by 0.72329 holding other factors in the model constant. Studies that corroborate these findings noted that access to a mobile phone and a SIM card is often a prerequisite for using digital financial services, such as mobile money and mobile banking (Rowntree, 2018) [69]. In many developing countries, mobile phone and SIM card ownership rates are lower among marginalized groups, such as women and the poor (Suri and Jack, 2016) [77]. Policies and initiatives to promote affordable access to mobile phones and SIM cards, such as subsidies or mandates for mobile network operators, can help address these gaps and improve digital inclusion.

The estimates further found having an additional household member with CBO membership, increased the households' odds of utilization of digital banking services by 1.96518 holding other factors in the model constant. These findings mirror findings by researchers who noted that CBOs can provide information, training, and hands-on support to help community members navigate and use digital services, such as online banking, e-government portals, and digital marketplaces (Alampay, 2006) [5]. This reduces the digital skills gap and increases digital literacy, enabling more individuals to overcome the barriers to digital adoption (Rao, 2008) [65]. Participation in CBOs can foster a sense of trust and community ownership, which is particularly important for the adoption of digital services, especially among marginalized groups (Gabor & Brooks, 2017) [29].

The estimates further found that an additional meal is missed as a result of poverty, increasing the odds of the utilization of digital banking services increased by 1.59182 holding other factors in the model constant. These findings corroborate findings by Hindson who noted that digital technologies can help the poor reduce transaction costs and increase the efficiency of their economic activities, such as mobile money transfers, online bill payments, and access to digital marketplaces. This can lead to significant cost savings that are particularly valuable for the poor, who often have limited financial resources (Hindson *et al*., 2019) [37].

Table 2: Logistic regression results

Variables	Coefficients	Margins
Utilization of Digital Banking	Odds Ratio	dy/dx
Household Size	0.97887 (0.01804)	-0.00379 (0.00332)
Number of Assets	1.16938*** (0.03280)	0.02775*** (0.00498)
Ownership of Smartphone	1.10529 (0.12997)	0.01775 (0.02095)
Having Nuclear members Abroad	1.09958 (0.13386)	0.01684 (0.02122)
Having Nuclear member in Kenya	0.63759*** (0.07372)	-0.07983*** (0.02061)
Receive Remittances	1.13020 (0.13239)	0.02171 (0.02048)
Own bank account	0.89232 (0.16608)	-0.02021 (0.03201)
Got Mobile banking	28.68742*** (6.16958)	0.59540*** (0.03225)
Engaged in Village/Community Savings and Loans Associations	0.07156*** (0.04615)	-0.46780*** (0.10228)
In need of Refugee ID	1.85221*** (0.20849)	0.10934*** (0.01933)
Sim card Ownership	0.72329** (0.10244)	-0.05746** (0.02445)
Membership of CBO	1.96518*** (0.40382)	0.11984*** (0.03643)
Food Insecurity	1.59182*** (0.18159)	0.08246*** (0.01992)
_cons	0.01680*** (0.00493)	
Number of Observations = 2403	Number of observations = 2403 LR chi2(13) = 766.85 Prob > chi2 = 0.000 Pseudo R2 = 0.2324	Number of observations = 2403 LR chi2(13) = 766.85 Prob > chi2 = 0.000 Pseudo R2 = 0.2324

Source: Authors' own computation

Summary of hypothesis testing

Hypothesis	Statistic	P-value	Conclusion
H_{01} Having a nuclear member abroad has no statistical significance on the utilization of digital banking	Coefficient =1.09958	0.428	H_{01} was accepted and a conclusion drawn that having a nuclear member abroad has no statistical significance on the utilization of digital banking
H_{02} Having a nuclear member in Kenya has no statistical significance on the utilization of digital banking by Urban refugees	Coefficient = 0.63759	0.000	H_{02} was rejected and a conclusion was drawn that having a nuclear member in Kenya has a statistical significance on the utilization of digital banking
H_{O3} Membership to a community-based organization has a statistical significance on the utilization of digital banking by Urban refugees	Coefficient =1.96518	0.000	H_{O3} was accepted and a conclusion was drawn that membership to a community-based organization has a statistical significance on the utilization of digital banking by Urban refugees
H_{O4} Owning a Smart Phone has a statistical significance on the utilization of digital banking by Urban refugees	Coefficient = 1.10529	0.397	H_{03} was rejected and a conclusion was drawn that owning a Smart Phone has no statistical significance on the utilization of digital banking by Urban refugees

Diagnostic tests

Goodness of fit

Goodness-of-fit tests are essential tools for validating assumptions, selecting appropriate models, and gaining a deeper understanding of the underlying data distribution, which is crucial for making informed decisions and drawing reliable conclusions from statistical analyses. Goodness-of-fit tests utilized include the Chi-square test. The choice of the appropriate test depends on factors such as the type of data, the specific probability distribution being tested, and the desired level of statistical power and sensitivity. The study conducted a goodness of fit test and found a Prob>chi2 of 0.4620 which indicated a good fit of the model.

Reliability test

Cronbach's alpha is a reliability test used to measure the internal consistency or reliability of a set of items or variables. It is a widely used method for assessing the reliability of multi-item scales or questionnaires. Cronbach's alpha measures the extent to which the items or variables within a scale or questionnaire are correlated with one another. A high Cronbach's alpha value indicates that the items are measuring the same underlying construct, suggesting good internal consistency. The study has a moderately reliable Cronbach alpha.

Normality test

Normality tests are statistical tests used to determine whether a dataset follows a normal (Gaussian) distribution. Many statistical analyses rely on the assumption that the data follows a normal distribution. Normality tests help verify this assumption, which is crucial for the validity and interpretation of the statistical inferences. Shapiro Wilk test was utilized and the results of less than 3 kurtosis and zero skewness informed the dataset to be normally distributed.

Correlation

Correlation tests are statistical methods used to measure the strength and direction of the linear relationship between two variables. In multiple regression analysis, high correlations between predictor variables can indicate the presence of multicollinearity, which can affect the reliability of the regression coefficients. Correlation tests therefore provide a measure of the strength of the linear relationship between two variables, ranging from -1 (perfect negative correlation) to +1 (perfect positive correlation). The study utilized the Pearson correlation coefficient, also known as Pearson's r. to provide a measure of the strength of the linear relationship between two variables, ranging from -1 (perfect negative correlation) to +1 (perfect positive correlation). The overall correlation between variables in the study was recorded at 0.6 and below.

Weaknesses of the study

The pseudo R^2 of 0.2324 indicates that the explanatory variables chosen can only account for 23.24% of changes in the dependent variable. This issue highlights the need to identify other predictor variables that will be instrumental in understanding the other 76.76% of the reason why Urban refugees choose to utilize or fail to utilize digital banking systems.

Conclusions and Recommendations

The Kenyan government and UNHCR can improve the number of assets in refugee households by providing financial assistance and Asset-Building Programs. Multi-national corporations such as the UN can offer cash transfers, grants, or subsidies to help refugee households build up their savings and acquire productive assets. The Kenyan government can also implement matched savings programs that encourage refugees to save by providing matching funds for their deposits. Local NGOs can also provide financial literacy and asset-building education to equip refugees with the knowledge and skills to manage their finances effectively. The banking sector can also establish microfinance initiatives or work with financial institutions to offer refugees collateral-free loans at low interest rates or provide loan guarantee schemes to help refugees access credit without the need for traditional collateral.

The research further noted that access to refugee cards, SIM Cards, and Mobile banking has the potential to increase the utilization of digital banking services by urban refugees in Kenya. To improve access to Mobile Banking the government can partner with financial institutions and mobile network operators to develop tailored mobile banking solutions for refugees, accommodating their specific needs and documentation requirements. The government can further partner with NGOs to provide financial literacy and digital skills training to help refugees understand and utilize mobile banking services effectively.

To improve access to SIM Cards the government of Kenya together with mobile network operators can streamline the process for refugees to obtain SIM cards by simplifying identification requirements and waiving certain fees or deposits. Mobile network operators can also offer specialized SIM card packages and data plans that are affordable and accessible for refugees. Major mobile network operators can also establish mobile network operator service points within refugee camps or settlements

to enable on-site SIM card distribution and activation.

To improve access to Refugee Cards, the government can ensure timely and efficient registration and issuance of refugee cards, which serve as a recognized form of identification. Decentralize the refugee card application and distribution process by setting up registration centers closer to refugee communities. The government can also provide language support and assistance to help refugees navigate the refugee card application process. The government can also collaborate with international organizations and humanitarian agencies to harmonize refugee card systems and facilitate cross-border recognition of the cards.

To improve the participation of refugee households in community-based organizations (CBOs) and village/community savings and loan associations, the government can offer outreach programs and raise awareness. The government can conduct targeted outreach campaigns within refugee communities to raise awareness about the benefits and opportunities offered by CBOs and savings and loan associations. The government can also collaborate with refugee community leaders, religious institutions, and local NGOs to disseminate information and promote the participation of refugees.

The government can also provide Institutional support and linkages by establishing partnerships between government agencies, local authorities, and community-based organizations to promote the inclusion of refugees. The government can also encourage the integration of refugee representatives into the governance structures of existing CBOs and savings and loan associations. The government can also review and revise policies and regulations to ensure they do not inadvertently exclude or disadvantage refugees from participating in community-based initiatives.

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