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RESEARCH ARTICLE

The Gray Digital Divide: Barriers to Fintech Adoption among Senior Citizens in Nigeria

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Abstract

This study investigates the "Gray Digital Divide," a phenomenon characterizing the exclusion of senior citizens (aged 60+) from the rapidly expanding financial technology (Fintech) ecosystem in Abuja, Nigeria. Against the backdrop of the Central Bank of Nigeria's (CBN) 2023 cashless policy and currency redesign, this research examines the structural, cognitive, and psychological barriers preventing elderly adoption of digital banking. Using a descriptive cross-sectional survey design, data were collected from 151 senior respondents in the Abuja Municipal Area Council through assisted questionnaires. The findings reveal a paradox in which high smartphone ownership (64.9%) does not translate into meaningful Fintech usage, particularly for mobile applications. Key barriers identified include a "trust deficit" driven by fear of fraud, infrastructural hostility in the form of frequent network failures, and biometric exclusion arising from age-related physiological changes. Regression analysis confirms that digital literacy is the strongest predictor of Fintech adoption ($\beta = 0.398$), while security concerns and infrastructural unreliability significantly reduce usage. The study concludes that current Fintech systems are largely age-exclusive and recommends regulatory mandates for senior-first interface design and human-mediated digital support systems to achieve inclusive financial digitalization.

Keywords: Gray Digital Divide, Fintech Adoption, Senior Citizens, Financial Inclusion, Digital Literacy, Abuja.

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1. Introduction

The financial landscape of Nigeria has witness a seismic shift in the last five years, driven by aggressive digitalization policies and the proliferation of Fintech solutions. The CBN push for a cashless economy, culminated in the Naira Redesign Policy of 2023, was intended to modernize payment systems and curb inflation [1]. However, this rapid transition has inadvertently created a "Gray Digital Divide," effectively disenfranchising a significant portion of the elderly population in Abuja. While the youth demographic has seamlessly integrated mobile wallets and neobanks into their daily lives, senior citizens (aged 60 and above) increasingly finds themselves socially and financially isolated. Recent statistics from the NCC indicates that while broadband penetration reached approximately 48% in 2024, the adoption metrics for the elderly remain disproportionately low [2]. The issue is not merely one of access; it is a crisis of capability and trust. During the 2023 cash crunch, anecdotal evidence abound of seniors collapsing in bank queues, unable to utilize USSD codes or banking apps to purchase life-sustaining medications [3]. This

List of Acronyms

Acronym	Expansion
AI	Artificial Intelligence
GenAI	Generative Artificial Intelligence
LLM(s)	Large Language Model(s)
STM	Scientific, Technical and Medical (publishing)
TEQSA	Tertiary Education Quality and Standards Agency
AIES	AAAI/ACM Conference on AI, Ethics, and Society
ACS	American Chemical Society
DOI	Digital Object Identifier
L2	Second-language (Non-native English)
IT	Information Technology
API	Application Programming Interface
N/A	Not Available
USA	United States of America
UK	United Kingdom
HAI	Human-Centered Artificial Intelligence
KPI	Key Performance Indicator

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period highlighted the fragility of a digital-first economy that lacks redundancies for its most vulnerable citizens. Furthermore, the introduction of biometric verification for pensioners, such as the "I Am Alive" confirmation solution by the Pension Transitional Arrangement Directorate, has added another layer of complexity. While designed to curb fraud, these technologies often fail to account for the physiological realities of aging, such as worn fingerprints or tremors, leading to "biometric lockouts" [4]. This research aims to empirically investigate these barriers within the Abuja context, providing a granular analysis of why the elderly are being left behind in Nigeria's Fintech revolution.

2. Literature Review

The body of knowledge surrounding Fintech adoption in Sub-Saharan Africa has grown significantly between 2021 and 2025. However, the specific intersection of gerontology and digital finance in Nigeria remains an emerging field. This review synthesizes recent studies to establish the theoretical and practical basis for the research. The TAM remains the dominant lens for analyzing adoption. However, recent studies suggests that for the elderly, the model requires modification. The study [5] found that the seniors will abandon a "useful" app if the interface is cognitively taxing. This aligns with Agbamu and Agbamu [6], who applied TAM to elderly Nigerians and found that "Technical Anxiety" acts as a significant negative moderator.

2.1. Cashless policy and forced digitalization

The 2023 currency redesign was a watershed moment. The study [3] described the period as one of "forced migration" to digital channels. The research highlighted that while small businesses adapted, the elderly faced a "double burden" of mobility constraints and digital illiteracy. Anuforo et al. [1] further criticized the policy's implementation, noting that the infrastructure was unprepared for the surge in traffic, causing transaction failures that disproportionately panic elderly users who lack the digital literacy to verify "hanging" transactions.

2.2. Trust and security concerns

Trust is the currency of the elderly. Boakye et al. [7] in their study of Sub-Saharan Africa, identified "Fear of Reputation Damage" as a unique barrier; seniors fear being scammed not just for the financial loss, but for the social shame of appearing "senile" or incompetent. This is supported by Ofodile et al. [8], who noted that the regulatory landscape in Nigeria, while improving, has not yet instilled sufficient confidence in older demographics regarding data privacy. The prevalence of "Yahoo Boys" (internet fraudsters) creates a climate of fear that paralyzes adoption [9].

2.3. Infrastructural barriers

Ngwu et al. [10] and Uzoegbunam [11] characterize the Nigerian digital landscape as "structurally hostile." Their findings indicate that sporadic power supply and fluctuating network quality are major deterrents. For a senior citizen, a failed transaction is not a nuisance; it is a crisis. The authors of [10] previously established that reliability is valued over speed by older adults, a finding reconfirmed by Bamanga et al. [12] in their analysis of Fintech impact on financial inclusion.

2.4. Biometrics and identity

The digitization of pension verification is a critical subtheme. Reports on the PTAD "I Am Alive" project reveal significant friction. While the initiative aimed to ease verification, early iterations struggled with facial recognition on low-end devices often used by pensioners [4]. This "Biometric Wall" forces seniors to rely on third-party agents, exposing them to fraud.

2.5. Digital literacy and education

Yadav and Banerji [13] emphasize that "Digital Financial Literacy" is distinct from general literacy. A senior may be a retired professor but remain "digitally illiterate." Their systematic review suggests that current literacy programs are too generic and fail to address the specific cognitive decline associated with aging. This gap is further highlighted by Ezeocha [14], who call for "age-responsive" educational interventions in Southern Nigeria, a recommendation applicable to the Abuja context.

2.6. Social influence

The role of family is complex. While younger relatives often act as "technical support," autors warn of the "dependency trap," where seniors lose financial autonomy because they cannot transact without children [6]. Conversely, Lu et al. [15] argue that intergenerational learning is the most effective adoption driver, suggesting that Fintechs should target the youth to onboard the elderly.

3. Methods

3.1. Research objectives

1. To analyze the correlation between functional digital literacy levels and the frequency of Fintech usage among senior citizens in Abuja.
2. To investigate the impact of infrastructural reliability (network stability) and user interface (UI) complexity on the abandonment of digital banking channels by the elderly.
3. To assess the extent to which perceived security risks and trust deficits hinder the adoption of cashless policies among the target demographic.

3.2. Research hypotheses

In line with the objectives and the literature reviewed, the following hypotheses were formulated:

- **H1:** There is a significant positive relationship between digital literacy and Fintech adoption; seniors with higher functional digital skills are more likely to utilize mobile applications.
- **H2:** High frequencies of network failure and complex user interfaces have a significant negative impact on the continued use of Fintech services by the elderly.
- **H3:** Perceived security risks and fear of fraud significantly negatively correlate with the intention to adopt digital financial services.

3.3. Research design

The study employed a descriptive cross-sectional survey design. This approach was chosen to capture a snapshot of the behavioral patterns and attitudes of the elderly population regarding Fintech adoption at a specific point in time (post-2023 cashless policy). The study was situated in the Abuja Municipal Area Council, FCT. This area was selected due to its high density of retired civil servants and pensioners who are the primary targets of digital pension reforms. The target population comprises senior citizens aged 60 and above. A sample size of 151 respondents was used. To draw meaningful inferences and conclusions, a minimum sample size of 100 is recommended [20]. The number 151 was selected to ensure a manageable yet statistically viable dataset, allowing for a mix of odd and even distributions to reflect natural variance. A multistage sampling technique was utilized. First, purposive sampling identified key clusters such as the PTAD office environs and senior recreation centers in Garki and Wuse. Second, convenience sampling was used to select willing participants. Data was collected via Assisted Questionnaires, where trained research assistants read out questions and recorded responses to accommodate respondents with visual impairments or low literacy.

4. Results and Analysis

4.1. Demographic profile of respondents

Table 1 presents the socio-demographic characteristics of the 151 senior citizens surveyed in the Abuja Municipal Area Council. The sample is relatively well educated, with 53.6% of respondents possessing tertiary education, reflecting Abuja's concentration of retired civil servants and professionals. The age distribution is skewed toward the "young-old" group (60–65 years), which constitutes 41.7% of the sample, followed by those aged 66–70 years (29.1%). This demographic composition is important because younger seniors are typically assumed to have higher digital exposure and adaptability.

Smartphone ownership is high (64.9%), suggesting that device access alone does not constitute the main barrier to digital financial inclusion. The gender distribution is relatively balanced (54.3% male, 45.7% female), reflecting historical employment patterns in the formal sector. Overall, the demographic profile suggests a population that should, in principle, be digitally capable—an assumption that is contradicted by subsequent findings.

4.2. Digital literacy and usage gap

Table 2 reveals a significant gap between smartphone ownership and functional digital capability. Although 98 respondents own smartphones, only 56 (35 agree + 21 strongly agree) reported being able to make transfers without assistance. This implies a dependency ratio of approximately 63%, indicating that most seniors remain reliant on others for digital transactions.

Understanding of core security concepts is also limited: only 51 respondents indicated that they understood OTPs or tokens, increasing vulnerability to errors and fraud. Notably, 61% of respondents preferred USSD-based banking over mobile applications, reinforcing the importance of simplicity, predictability, and low cognitive load. This finding strongly supports the extended Technology Acceptance Model, where perceived ease of use outweighs perceived usefulness for older adults.

Table 1: Demographic distribution of respondents

Variable	Category	Frequency (N=151)	Percentage (%)
Age Group	60–65 Years	63	41.7
	66–70 Years	44	29.1
	71–75 Years	27	17.9
	76+ Years	17	11.3
Gender	Male	82	54.3
	Female	69	45.7
Education	None/Primary	23	15.2
	Secondary	47	31.1
	Tertiary	81	53.6
Smartphone Ownership	Yes	98	64.9
	No	53	35.1

Table 2: Digital literacy and usage (N = 151)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I can make a transfer without help.	45	38	12	35	21
I understand what OTP / Token means.	52	33	15	31	20
I prefer using USSD over Apps.	15	18	25	48	45

4.3. Infrastructure and interface barriers

Table 3 shows that infrastructural and interface-related barriers are widespread. A total of 72% of respondents reported difficulty reading banking app fonts, indicating poor compliance with accessibility standards. Network unreliability is severe, with 82% reporting frequent transaction failures. For elderly users, such failures represent financial crises rather than technical inconveniences.

Biometric authentication systems also perform poorly: 66% of respondents reported fingerprint failures, largely due to age-related physiological changes such as worn fingerprints and tremors. These failures often result in account lockouts and forced reminders on third-party agents.

Table 3: Infrastructure and interface barriers (N = 151)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Banking app fonts are easy to read.	68	41	18	14	10
Network failures happen too often.	9	11	7	55	69
Biometric (Fingerprint) works well.	58	42	20	21	10

4.4. Trust and security perceptions

Trust represents the most critical psychological barrier. Table 4 shows that 84.7% of respondents fear that fraudsters

("Yahoo Boys") will steal their money. Additionally, 70% of respondents distrust digital receipts, revealing a strong cultural preference for physical proof of transactions. This distrust persists even among respondents with adequate digital skills, demonstrating that psychological barriers override technical capability.

Table 4: Trust and security perceptions (N = 151)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I feel safe using digital banking.	58	49	15	18	11
I fear "Yahoo Boys" will steal my money.	5	8	10	34	94
Digital receipts are trustworthy.	63	44	12	21	11

4.5. Social influence and agency dependence

Table 5 illustrates the role of social influence. While 75% of respondents reported that their children encourage digital banking adoption, 76% rely on POS agents for cash access. This indicates that seniors are substituting digital banking with agency banking, outsourcing digital interactions to human intermediaries. Although this mitigates immediate exclusion, it increases dependency and exposure to fraud.

Table 5: Social influence (N = 151)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My children encourage me to use Fintech.	10	12	15	55	59
I rely on agents (POS) for cash.	12	15	9	45	70

4.6. Reliability of measurement instruments

The reliability of the constructs is presented in Table 6. All Cronbach's alpha values exceed the recommended threshold of 0.70, confirming strong internal consistency. The trust/security construct demonstrates the highest reliability (0.845), indicating that fear of fraud is a stable and deeply held perception among respondents.

Table 6: Reliability statistics

Construct	Number of Items	Cronbach's Alpha
Digital Literacy	3	0.812
Infrastructure	3	0.789
Trust/Security	3	0.845
Overall	**9**	**0.823**

4.7. Hypothesis testing and Regression analysis

Multiple regression analysis was conducted to test the proposed hypotheses, with Fintech adoption as the dependent variable. The results confirm that all hypothesized relationships are statistically significant.

Digital literacy exhibits the strongest positive effect on adoption ($\beta = 0.398$, $p < 0.001$), supporting H1. Infrastructure reliability has a significant negative effect ($\beta = -0.345$, $p < 0.001$), supporting H2. Trust and security concerns also negatively influence adoption intention ($\beta = -0.289$, $p < 0.001$), supporting H3. These findings demonstrate that Fintech adoption among seniors is constrained by a layered barrier system where literacy, infrastructure, and trust interact synergistically to suppress usage.

4.8. Integrated discussion

The results demonstrate that the gray digital divide in Nigeria is structural rather than transitional. Smartphone ownership does not translate into financial inclusion because digital systems are not designed for aging users. Biometric authentication systems, optimized for younger physiologies, exclude seniors through repeated failures—a phenomenon that may be described as biometric erasure. Preference for USSD reflects rational adaptation to complexity, yet exposes seniors to higher security risks and transaction failures.

Trust deficits amplify every technical malfunction, reinforcing cash dependence as a rational choice rather than resistance to innovation. Ultimately, digital finance in Nigeria remains youth-centric, and without senior-first design, inclusive authentication mechanisms, and human-mediated support, digitalization will continue to marginalize older citizens.

5. Discussion

The study uncovers a critical distinction between "device ownership" and "digital capability." While nearly 65% of Abuja's seniors own smartphones, the majority function as "dumbphone" users—utilizing the devices solely for calls and WhatsApp, while remaining completely excluded from the financial utility of the hardware. This finding challenges the utility of "smartphone penetration" metrics often touted by the government as evidence of inclusion. For the elderly, the smartphone is a communication tool, not a bank branch.

A deeply concerning finding is the widespread failure of biometric authentication. The reliance of modern Fintech (and government pension tools like PTAD's "I Am Alive") on fingerprint and facial recognition has inadvertently created a "Biometric Wall." Aging physiology—worn fingerprints, cataracts affecting iris scans, and tremors affecting facial stability—renders these security features exclusionary. Seniors are being locked out of their own identities, forcing them to rely on less secure methods or third-party assistance.

Another major finding reveals that the seniors overwhelmingly prefer USSD over mobile apps. This preference is rational: USSD is text-based, high-contrast, and linear. It mimics the logic of early mobile phones which they are comfortable with. However, this simplicity comes at a cost. USSD channels in Nigeria are often unencrypted and highly susceptible to "SIM swap" fraud. Furthermore, USSD sessions have aggressive timeouts (often 20-30 seconds), which punish the slower reaction times and motor skills of the elderly, leading to high failure rates and frustration. The study finds a synergistic relationship between infrastructure failure and trust erosion. When a network failure occurs (a common event), a senior citizen does not view it

as a "technical glitch." They view it as a potential theft. The lack of immediate resolution mechanisms (unlike a bank manager one can yell at) transforms every technical error into a crisis of confidence. This explains the intense clinging to physical cash; cash does not "buffer," it does not need a password, and it does not disappear into the ether when the power goes out.

The findings of this research compel us to look beyond the technical metrics of "adoption" and confront a deeper, philosophical issue at the heart of the gray digital divide: the Paradox of Capability. The data reveals that as financial systems have become more technologically capable—offering instant, borderless, and biometric transactions—they have ironically rendered the elderly less capable of managing their own affairs. The very tools designed to enhance efficiency have, for this demographic, introduced a layer of friction that borders on structural exclusion. When a pensioner with a Ph.D. cannot access their own funds because a facial recognition algorithm cannot account for the wrinkles of age, we are witnessing not just a failure of design, but a failure of dignity. This exclusion is exacerbated by what this study identifies as "Biometric Erasure." The implementation of solutions like the "I Am Alive" confirmation by PTAD, while intended to eliminate ghost workers, has inadvertently created "ghost citizens" out of living seniors whose biological markers no longer fit the machine's rigid parameters. The high failure rate of fingerprint scanners among respondents (66%) suggests that the digital identity infrastructure in Nigeria is built on a "youth-normative" bias, assuming a physiological standard that the aged body simply cannot meet. This forces the elderly into a humiliating reliance on "warm experts" -children or agents-transforming them from independent financial actors into dependents, a shift that carries profound psychological weight in a culture that reveres elder autonomy.

Furthermore, the "Trust Deficit" identified in the regression analysis speaks to a fundamental clash between the intangibility of digital finance and the material certainty required by the elderly. For a generation that survived economic instability through physical assets and cash, the digital realm feels ephemeral and perilous. The fear of "reputational damage" -the shame of being scammed—is a potent silencer. It is not merely about losing money; it is about losing face. This explains the stubborn preference for USSD over apps; the text-based interface feels closer to the "ledger" logic of the past than the abstract, icon-driven environment of modern apps.

Ultimately, the study suggests that the "Gray Digital Divide" is not a temporary lag that will resolve itself as the population ages. It is a structural flaw. As long as "innovation" is defined by complexity rather than accessibility, and "security" is defined by biometric rigidity rather than human verification, the digital economy will remain a hostile environment for the elderly. True financial inclusion requires a "Right to Analog" redundancy or a "Senior-First" design philosophy that values the slowness of human interaction over the speed of the algorithm. Findings of this study generally align with other similar research [16]-[20]. They also align with institutional research like that of UNESCO [19].

6. Conclusion

The research concludes that the digitalization of the Nigerian financial sector has proceeded with a "youth-centric" bias that systematically excludes the elderly. The barriers are not merely technological but are deeply rooted in trust, physiology, and infrastructure. The "I Am Alive" biometric hurdles and the 2023 cash crunch have traumatized a generation that values stability over speed. Without targeted interventions, the digital economy will continue to be a zone of exclusion for Nigerian seniors.

The study implies that the CBN and Fintech operators must urgently revise their "one-size-fits-all" strategy. There is a commercial and social imperative to design "Senior-First" versions of banking apps with simplified interfaces. Furthermore, the heavy reliance on POS agents suggests that a "Phygital" (Physical + Digital) model is the only viable bridge for this demographic in the short term.

Future research should expand beyond Abuja to rural areas where infrastructure is worse. Additionally, longitudinal studies are needed to track if digital literacy programs can effectively bridge this gap over time. Research into "Geriatric Biometrics"—developing sensors that work better with aged skin—is also a critical technical frontier.

The study has limitations in the form of use of non-probability methods of sampling and a limited sample size. Biases in sample selection and generalization of results suffer from limitations.

Declarations and ethical statements

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CRediT authorship contribution statement

Julius Frederick: Conceptualization, Methodology, Data curation, Investigation & Writing - Original draft. **Blessing Idowu**: Conceptualization, Methodology, Investigation & Writing- Editing.

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