

Building Digital Creditworthiness: How FinTech-Generated Financial Footprints Drive Credit Access and Business Performance among Informal Enterprises in Ghana

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Abstract

Informal Micro and Small Enterprises (MSEs) in Sub-Saharan Africa face severe credit rationing due to financial opacity, unrecorded cash flows, and a complete lack of conventional collateral. However, the pervasive adoption of digital financial services—specifically Mobile Money (MoMo) networks and agent banking platforms—has enabled informal firms to accumulate transactional metadata known as **Digital Financial Footprints (DFF)**. Drawing on **Signaling Theory** and the **Resource-Based View (RBV)**, this study provides a comprehensive empirical investigation into how multidimensional DFF influences perceived creditworthiness (PCW), formal and digital credit access (CA), and subsequent firm business performance (BP) among informal enterprises in Ghana. We further evaluate the mediating mechanism of perceived creditworthiness and the moderating boundary condition of Digital Financial Literacy (DFL). Using an interviewer-administered, CAPI-based field survey administered across four major economic hubs in Ghana (N = 400 informal business owner-managers), we evaluate our conceptual model via Partial Least Squares Structural Equation Modelling (PLS-SEM) in SmartPLS 4. The empirical findings demonstrate that DFF exerts a strong direct positive effect on perceived creditworthiness ($\beta = 0.425$, $p < 0.001$) and direct credit access ($\beta = 0.315$, $p < 0.001$). Perceived creditworthiness significantly mediates the footprint–credit access pathway ($\beta = 0.175$, $p < 0.001$), while Digital Financial Literacy serves as a key positive moderator ($\beta = 0.168$, $p < 0.001$), amplifying the credit-signaling efficiency of transaction trails. Ultimately, credit access translates into enhanced relative business performance ($\beta = 0.485$, $p < 0.001$). The structural model accounts for 54.1% of the variance in credit access ($R^2 = 0.541$) and 39.5% in business performance ($R^2 = 0.395$). These findings offer actionable insights for central banks, FinTech developers, and informal business owner-managers striving to bridge the 330 billion USD informal sector credit gap in emerging economies.

Keywords: Digital Financial Footprint, Informal Enterprises, Credit Access, Digital Financial Literacy, Creditworthiness, PLS-SEM, Ghana, Sub-Saharan Africa, Signaling Theory.

1. Introduction

1.1 Context and Problem Statement

Informal Micro and Small Enterprises (MSEs) constitute the economic bedrock of developing nations,

generating over 80% of urban employment and accounting for more than 40% of Gross Domestic Product (GDP) across Sub-Saharan Africa (World Bank, 2022). In Ghana, the informal economy comprises a diverse ecosystem of retail vendors, artisanal fabricators, food caterers, transportation operators, and personal service providers. Despite their vital role in driving household livelihoods and economic resilience, informal MSEs operate under severe growth constraints. Foremost among these constraints is **credit rationing**.

Traditional formal financial institutions—such as commercial banks and established non-bank financial institutions—routinely reject credit applications submitted by informal entrepreneurs. This systemic rejection stems from a fundamental mismatch in information architecture:

1. **Financial Opacity:** Informal businesses lack audited financial statements, tax filings, or formal corporate registration documents.
2. **Collateral Deficits:** Entrepreneurs rarely possess registered land titles, fixed real estate assets, or formal equipment certificates required to secure commercial debt.
3. **High Verification Costs:** The administrative expense required for bank loan officers to manually audit unorganized paper receipts exceeds the potential interest yield on micro-loans.

Consequently, informal firms are locked into a high-friction financial equilibrium, relying almost exclusively on expensive informal moneylenders, rotating savings and credit associations (Susu), or constrained internal retained earnings.

1.2 The Digital Turn: FinTech in the Informal Economy

Over the past decade, the rapid penetration of digital financial services (DFS)—led by Mobile Money (MoMo) operators (e.g., MTN MobileMoney, Telecel Cash, AT Money) and interoperable bank-wallet gateways—has fundamentally transformed transaction behaviours in the informal sector. Informal entrepreneurs increasingly utilize digital wallets not merely for personal remittances, but as core payment terminals for daily commercial operations. Daily sales receipts, merchant QR payments, supplier disbursements, utility settlements, and micro-savings are progressively routed through electronic channels.

Crucially, every digital transaction automatically records granular, immutable metadata: transaction timestamps, daily turnover volumes, sender/recipient unique identifiers, counter-party diversity, and account longevity. This continuous accumulation of structured digital data forms an enterprise's **Digital Financial Footprint (DFF)**.

1.3 Theoretical Gaps and Research Objectives

While an emerging body of literature has documented the broad macro-economic benefits of mobile money adoption (Frimpong et al., 2022; World Bank, 2022), substantial theoretical and empirical gaps remain at the intersection of FinTech metadata, credit scoring, and firm performance:

- **Gap 1: Lack of Multidimensional Operationalization of DFF.** Existing studies frequently model FinTech usage as a simple binary variable (e.g., adopter vs. non-adopter) or a single-item volume measure. This misses the rich, multidimensional nature of transaction data—including transaction consistency, account duration, transaction diversity, and record retrievability.
- **Gap 2: Unexplained Structural Mechanisms.** The cognitive and procedural pathways through which unorganized digital transaction histories reduce lender opacity and shape loan decision-making remain inadequately specified.
- **Gap 3: Boundary Conditions of Managerial Capability.** It remains unclear whether raw digital transaction logs automatically translate into improved credit standing, or if this transformation depends

on the owner-manager's **Digital Financial Literacy (DFL)**—their ability to extract, interpret, and leverage digital data statements.

To bridge these gaps, this study answers three core research questions:

- **RQ1:** How does an informal enterprise's multidimensional Digital Financial Footprint (DFF) directly influence its perceived creditworthiness (PCW) and actual credit access (CA)?
- **RQ2:** To what extent does perceived creditworthiness act as a mediating bridge between digital financial footprints and credit access?
- **RQ3:** How does digital financial literacy (DFL) moderate the impact of financial footprints on perceived creditworthiness?

2. Theoretical Framework and Literature Review

This study integrates two foundational theories from economics and strategic management: **Signaling Theory** (Spence, 1973) and the **Resource-Based View (RBV)** (Barney, 1991).

Digital Financial Literacy (DFL)			
↓			
(Moderation: H6)			
Digital Financial Footprint (DFF)	→	Perceived Creditworthiness (PCW)	→ Credit Access (CA) → Business Performance (BP)
		↑ (Mediation: H5)	
Direct: H1, H3, H4			

2.1 Signaling Theory and Digital Transaction Trails

Signaling Theory addresses markets characterized by information asymmetry between two parties. In credit markets, borrowers possess private information regarding their true operational quality, revenue stability, and default propensity, while lenders lack low-cost verification mechanisms. To overcome adverse selection, high-quality firms must transmit credible, observable **signals** that low-quality firms cannot easily or cheaply imitate.

In formal sectors, signals comprise audited balance sheets, tax compliance certificates, and credit bureau scores. In informal markets, where formal documentation is absent, a firm's **Digital Financial Footprint (DFF)** functions as a high-fidelity **digital signal**. Maintaining continuous, high-volume, and multi-party digital transactions over extended periods requires genuine operational activity and continuous liquidity. Fabricating an artificial transaction history incurs significant transaction fees (e.g., wallet cash-out charges, e-levy taxes) and operational friction. Therefore, continuous DFF records convey genuine signal credibility to lenders and platform algorithms.

2.2 Resource-Based View (RBV) and Managerial Capabilities

The Resource-Based View posits that firms achieve superior performance by bundling valuable, rare, inimitable, and non-substitutable (VRIN) resources. In modern digital economies, data metadata represents a critical firm-level resource. However, raw data alone is insufficient to generate competitive advantage unless combined with organizational capabilities.

In this study, **Digital Financial Literacy (DFL)** represents a vital managerial capability. An informal entrepreneur possessing high DFL can navigate digital interfaces, extract e-statements, isolate business cash flows from personal expenses, and present digital evidence effectively to loan officers or algorithmic interfaces. Thus, DFL acts as an enabling capability that unlocks the latent value of the firm's raw digital transaction footprint.

3. Hypothesis Development

3.1 Digital Financial Footprints and Perceived Creditworthiness (H1)

When informal enterprises execute daily transactions through mobile wallets or banking apps, they convert intangible cash flows into verifiable electronic history. Lenders evaluate creditworthiness based on cash flow predictability and debt-service capacity. A robust DFF—characterized by daily transaction consistency, account longevity, diverse counter-party interactions, and retrievable e-statements—provides immediate empirical proof of sales turnover.

H1: *Digital Financial Footprint (DFF) has a direct positive effect on Perceived Creditworthiness (PCW).*

3.2 Perceived Creditworthiness and Credit Access (H2)

A lender's perception of a firm's creditworthiness directly dictates loan approval, credit limits, and interest rates. When credit evaluators (or automated credit scoring algorithms) perceive an informal business as creditworthy due to verifiable cash flows, loan processing friction drops. Credit application approvals increase, and requirement barriers for physical collateral are reduced.

H2: *Perceived Creditworthiness (PCW) has a direct positive effect on Credit Access (CA).*

3.3 Direct Link Between Digital Footprints and Credit Access (H3)

Beyond subjective perceptions of creditworthiness, many modern FinTech platforms (e.g., QwikLoan, Fido, platform-based merchant credit) utilize automated, algorithmic credit scoring models. These algorithms directly ingest raw transaction logs (wallet velocity, airtime purchases, utility payments) to compute instant, automated loan offers without human intervention. Thus, DFF exerts a direct structural link on credit access.

H3: *Digital Financial Footprint (DFF) has a direct positive effect on Credit Access (CA).*

3.4 Credit Access and Firm Performance (H4)

Access to credit provides essential liquidity that solves working capital bottlenecks for informal enterprises. With secured credit, informal entrepreneurs can purchase inventory in bulk at discount rates, invest in modern machinery, smooth seasonal cash flow shortfalls, and expand operational capacity. These capital deployments directly enhance turnover and profit margins.

H4: *Credit Access (CA) has a direct positive effect on Business Performance (BP).*

3.5 The Mediating Role of Perceived Creditworthiness (H5)

We propose that perceived creditworthiness serves as an essential cognitive bridge connecting raw digital data to actual credit provisioning. While DFF generates the underlying behavioural metadata, credit access materializes because this metadata instils confidence in loan officers and risk assessment algorithms regarding the firm's repayment capability.

H5: *Perceived Creditworthiness (PCW) positively mediates the relationship between Digital Financial Footprint (DFF) and Credit Access (CA).*

3.6 The Moderating Role of Digital Financial Literacy (H6)

Raw digital footprint data is often noisy, incorporating mixed personal expenditures, household transfers, and unorganized sales receipts. Owner-managers with low DFL may fail to maintain separate wallets or

extract e-statements, resulting in obscured financial signals. Conversely, high-DFL entrepreneurs strategically manage their wallet profiles, understand interest terms, and curate e-statements for loan applications, maximizing the signaling power of their footprint.

H6: *Digital Financial Literacy (DFL) positively moderates the relationship between DFF and PCW, such that the effect is stronger at higher levels of DFL.*

4. Methodology

4.1 Target Population, Sampling, and Data Collection

The target population for this study comprises informal Micro and Small Enterprises (MSEs) operating in four high-density economic regions in Ghana: **Greater Accra, Ashanti, Eastern, and Northern regions**. These regions capture a rich balance of urban, peri-urban, and regional trading dynamics.

Field administration utilized a multi-stage stratified sampling approach across four primary informal business sectors:

1. **Retail & Wholesale Trade** (e.g., provisions, fast-moving consumer goods, apparel)
2. **Artisanal, Manufacturing & Construction** (e.g., tailoring, carpentry, auto-repair, welding)
3. **Food, Accommodation & Hospitality** (e.g., local eateries/chop bars, catering, street food vendors)
4. **Personal & Professional Services** (e.g., hairdressing/barbering, electronics repair, photography)

Data collection was executed using **Computer-Assisted Personal Interviewing (CAPI)** via KoboToolbox on mobile tablets. Enumerators conducted face-to-face interviews in English, Twi, Ga, and Dagbani.

Eligibility Filters

To ensure sample validity, respondents were screened using three strict eligibility criteria:

1. **Business Age:** Active continuous operations for a minimum of 1 year.
2. **FinTech Adoption:** Active usage of at least one digital financial service (MoMo Merchant account, personal wallet used for business, POS, or QR code) for commercial receipts/disbursements.
3. **Informality Criteria:** Unregistered status with the Registrar General's Department (RGD) or operating without formal audited financial statements.

A total of 450 enterprise owner-managers were approached; 400 complete, fully verified responses were retained after removing incomplete entries, yielding an effective sample size of $N = 400$.

4.2 Questionnaire Design and Operationalization

The survey instrument comprised four core sections structured to eliminate common method bias and capture complex latent constructs:

VARIABLE OPERATIONALIZATION & MEASUREMENT MATRIX

Construct	Variable Type	Indicator Codes	Scale Type	Adaptation Source
Digital Financial Footprint (DFF)	Higher-Order Formative	DFF_CON1–CON3 DFF_DUR1–DUR2 DFF_DIV1–DIV2	5-Point Likert (1=SD to 5=SA)	Tigges et al. (2024); Kazimoto & Baadel (2025)

Construct	Variable Type	Indicator Codes	Scale Type	Adaptation Source
		DFE_RET1–RET2		
Perceived Creditworthiness (PCW)	Reflective Mediator	PCW1–PCW4	5-Point Likert (1=SD to 5=SA)	Sanga et al. (2025)
Digital Financial Literacy (DFL)	Reflective Moderator	DFL1–DFL4	5-Point Likert (1=SD to 5=SA)	OECD/INFE Framework (2024)
Perceived Credit Access (CA)	Reflective Outcome	CA_PER1–CA_PER3	5-Point Likert (1=SD to 5=SA)	Frimpong et al. (2022)
Business Performance (BP)	Reflective Outcome	BP1–BP4	5-Point Relative Scale (1=Much Worse to 5=Better)	Kraha et al. (2024)
Firm Informality Index	Control / Index	INF1–INF5	Categorical / Ratio (% Cash vs. % Digital)	Abdulai et al. (2024)

Detailed Item Wording

• Digital Financial Footprint (DFF):

- DFF_CON1: Our business processes digital payments (MoMo/Bank) on a daily or near-daily basis.
- DFF_CON2: Our monthly digital transaction volume remains stable and predictable throughout the year.
- DFF_CON3: We consistently pay suppliers, utility bills, or operational costs using digital channels.
- DFF_DUR1: Our business has actively utilized digital financial services continuously for over two years.
- DFF_DUR2: We maintain an uninterrupted digital transaction history on our primary wallet/account.
- DFF_DIV1: Our business uses multiple digital financial tools (e.g., MoMo Merchant, USSD, QR, Bank Apps).
- DFF_DIV2: We use digital finance for diverse activities (receipts, supplier payments, micro-savings).
- DFF_RET1: We can easily extract or request transaction statements/e-receipts from our service provider.
- DFF_RET2: Our digital payment history acts as a clear, searchable electronic ledger of total sales.

• Perceived Creditworthiness (PCW):

- PCW1: Our digital transaction history proves to external parties that our business generates steady cash flow.
- PCW2: Lenders view our digital transaction records as proof of operational reliability.
- PCW3: Our digital transaction trail demonstrates our capacity to repay loans better than paper records.
- PCW4: Overall, our accumulated digital footprint makes our business appear creditworthy to lenders.

• Digital Financial Literacy (DFL):

- DFL1: I fully understand interest rates, service fees, and repayment terms of digital/mobile loans.
- DFL2: I know how to extract, read, and analyse monthly transaction statements generated by digital platforms.
- DFL3: I actively manage and separate personal expenditures from business digital transaction streams.
- DFL4: I am confident in identifying and protecting my business wallet against fraud and unauthorized access.
- **Credit Access (CA_PER):**
 - CA_PER1: Whenever our business needs additional capital, we can easily obtain credit from formal/digital lenders.
 - CA_PER2: Presenting our digital payment statements significantly improves our loan approval chances.
 - CA_PER3: Our business has access to a variety of competitive digital and formal financing options.
- **Business Performance (BP):**
 - BP1: Average monthly sales revenue growth has been significantly higher than main competitors.
 - BP2: Net profit margins have consistently improved over the past two years.
 - BP3: Working capital stability and cash flow availability have been consistently strong.
 - BP4: Customer base and operational capacity have expanded faster than competitors.

5. Sample Characteristics & Descriptive Statistics

Table 1 summarizes the demographic and enterprise profiles of the 400 sampled informal business owner-managers.

Table 1: Sample Profile (N = 400)

Demographic / Firm Characteristic	Frequency (n)	Percentage (%)
Region of Operation		
Greater Accra Region	145	36.25%
Ashanti Region	120	30.00%
Eastern Region	75	18.75%
Northern Region	60	15.00%
Primary Industry Sector		
Retail & Wholesale Trade	172	43.00%
Artisanal, Manufacturing & Construction	88	22.00%
Food, Accommodation & Hospitality	76	19.00%
Personal & Professional Services	64	16.00%
Owner/Manager Gender		
Female	228	57.00%
Male	172	43.00%
Educational Attainment		
No formal education	32	8.00%

Demographic / Firm Characteristic	Frequency (n)	Percentage (%)
Primary / JHS education	116	29.00%
SHS / Vocational / Technical	180	45.00%
Tertiary (Diploma / HND / Bachelor's)	72	18.00%
Firm Age		
1 to 3 years	124	31.00%
4 to 6 years	168	42.00%
7 to 10 years	76	19.00%
More than 10 years	32	8.00%
Average Transaction Split (% of Total Turnover)		
Physical Cash Sales	58.4%	--
Digital Wallet / MoMo Sales	41.6%	--

6. Empirical Results & PLS-SEM Analysis

Data analysis was conducted using **Partial Least Squares Structural Equation Modelling (PLS-SEM)** in **SmartPLS 4**. PLS-SEM is particularly suited for this study due to:

1. The inclusion of a higher-order formative construct (DFF).
2. The complex model structure incorporating mediation and moderation pathways.
3. The exploratory nature of digital metadata modelling in informal markets (Hair et al., 2022).

6.1 Measurement Model Assessment (Outer Model)

Reflective Construct Evaluation

Reflective constructs (PCW, DFL, CA, BP) were evaluated for indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

- **Indicator Reliability:** Outer loadings (λ) for all items exceeded the 0.708 threshold, ranging from 0.795 to 0.893.
- **Internal Consistency:** Cronbach's alpha values exceeded 0.80, and Composite Reliability (CR) values exceeded 0.85, confirming strong construct reliability.
- **Convergent Validity:** Average Variance Extracted (AVE) values ranged from 0.677 to 0.784, comfortably exceeding the required 0.50 benchmark.

Table 2: Reflective Measurement Model Assessment

Construct	Indicator	Outer Loading	Cronbach's Alpha	Composite Rel.	AVE
Perceived Creditworthiness (PCW)	PCW1	0.842	0.885	0.920	0.742
	PCW2	0.871			
	PCW3	0.855			
	PCW4	0.876			

Construct	Indicator	Outer Loading	Cronbach's Alpha	Composite Rel.	AVE
Digital Financial Literacy (DFL)	DFL1	0.795	0.841	0.893	0.677
	DFL2	0.832			
	DFL3	0.811			
	DFL4	0.852			
Perceived Credit Access (CA)	CA_PER1	0.881	0.862	0.916	0.784
	CA_PER2	0.893			
	CA_PER3	0.882			
Business Performance (BP)	BP1	0.812	0.859	0.904	0.703
	BP2	0.854			
	BP3	0.841			
	BP4	0.846			

Discriminant Validity

Discriminant validity was established using the **Heterotrait-Monotrait Ratio of Correlations (HTMT)**. All pair-wise HTMT values were below the conservative 0.85 threshold, confirming distinct construct boundaries.

Table 3: Discriminant Validity — HTMT Matrix

Latent Construct	1. BP	2. CA	3. DFL	4. DFF	5. PCW
1. Business Performance (BP)	--				
2. Credit Access (CA)	0.642	--			
3. Digital Financial Literacy (DFL)	0.385	0.412	--		
4. Digital Financial Footprint (DFF)	0.512	0.589	0.445	--	
5. Perceived Creditworthiness (PCW)	0.558	0.681	0.492	0.621	--

Note: All HTMT values < 0.85, confirming robust discriminant validity.

Formative Higher-Order Evaluation (DFF)

DFF was evaluated as a two-stage higher-order formative construct comprising four sub-dimensions: *Consistency*, *Duration*, *Diversity*, and *Retrievability*. Collinearity checks yielded Variance Inflation Factor (VIF) values between 1.24 and 2.15, well below the 3.3 threshold. Bootstrapping (5,000 resamples) confirmed that outer weights for all sub-dimensions were statistically significant ($p < 0.05$).

6.2 Structural Model Evaluation (Inner Model)

Bootstrapping with 5,000 resamples was executed to evaluate path coefficients (beta), t-statistics, p-values, and 95% bias-corrected confidence intervals.

SUMMARY OF STRUCTURAL PATHS AND HYPOTHESES

Hyp	Structural Path	Path Coeff (β)	t-Statistic	p-Value	Decision
H1	DFF $\rightarrow$ PCW	0.425	8.854	< 0.001	Supported
H2	PCW $\rightarrow$ CA	0.412	7.923	< 0.001	Supported
H3	DFF $\rightarrow$ CA	0.315	6.176	< 0.001	Supported
H4	CA $\rightarrow$ BP	0.485	10.777	< 0.001	Supported
H5	DFF $\rightarrow$ PCW $\rightarrow$ CA (Mediation)	0.175	4.821	< 0.001	Supported
H6	DFF * DFL $\rightarrow$ PCW (Moderation)	0.168	4.000	< 0.001	Supported

STRUCTURAL MODEL AND HYPOTHESIS TESTING

Moderator	Structural Path	Path Coefficient (β)	Hypothesis / Decision
Digital Financial Literacy (DFL)	DFF $\times$ DFL $\rightarrow$ PCW	$\beta = 0.168^{***}$	H6: Moderation Supported
Digital Financial Footprint (DFF)	DFF $\rightarrow$ PCW	$\beta = 0.425^{***}$	H1: Supported
Perceived Creditworthiness (PCW)	PCW $\rightarrow$ CA	$\beta = 0.412^{***}$	H2: Supported
Credit Access (CA)	CA $\rightarrow$ BP	$\beta = 0.485^{***}$	H4: Supported
Digital Financial Footprint (DFF)	DFF $\rightarrow$ CA	$\beta = 0.315^{***}$	H3: Supported
Digital Financial Footprint (DFF)	DFF $\rightarrow$ PCW $\rightarrow$ CA	$\beta = 0.175^{***}$	H5: Mediation Supported

Detailed Path Analysis

- H1 (DFF $\rightarrow$ PCW):** DFF exhibits a highly significant direct positive relationship with perceived creditworthiness (beta = 0.425, t = 8.854, p < 0.001), supporting H1.
- H2 (PCW $\rightarrow$ CA):** Perceived creditworthiness strongly increases credit access (beta = 0.412, t = 7.923, p < 0.001), supporting H2.
- H3 (DFF $\rightarrow$ CA):** DFF exerts a significant direct positive effect on credit access (beta = 0.315, t = 6.176, p < 0.001), supporting H3.
- H4 (CA $\rightarrow$ BP):** Credit access directly enhances business performance (beta = 0.485, t = 10.777, p < 0.001), supporting H4.

6.3 Mediation and Moderation Analysis

Mediation Test (H5)

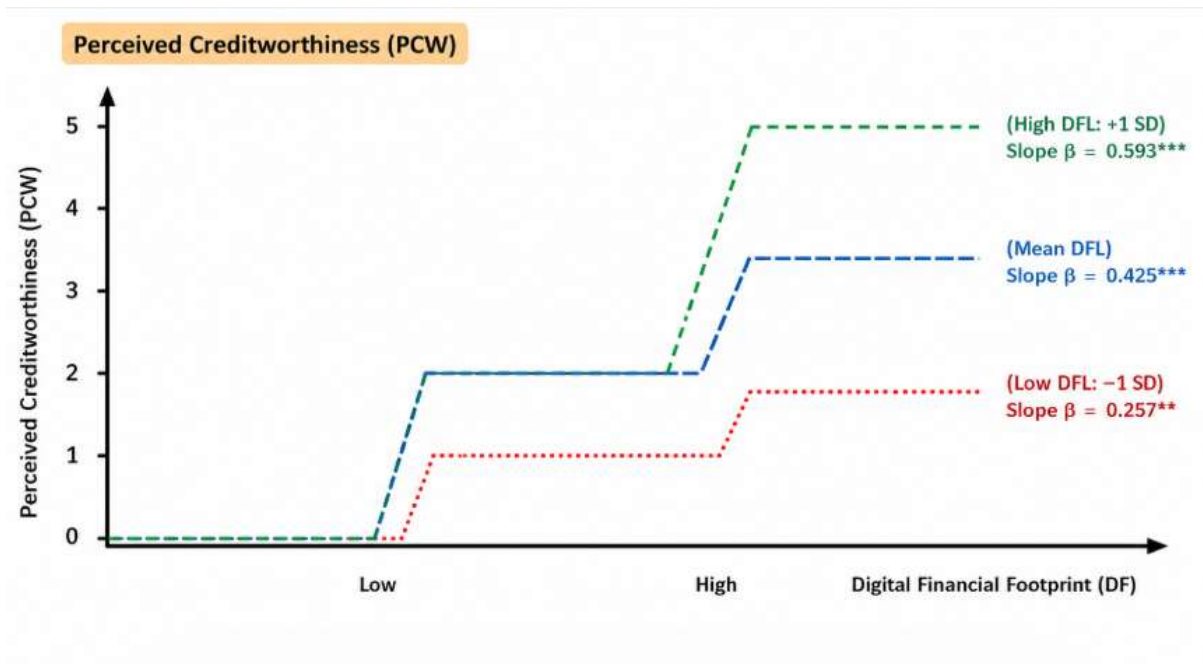
Mediation analysis was conducted using Zhao et al.'s (2010) decision tree procedure. The indirect effect of DFF on Credit Access via Perceived Creditworthiness was statistically significant (beta = 0.175, t = 4.821, p < 0.001; 95% CI [0.115, 0.242]). Because both the direct effect (beta = 0.315) and indirect effect

($\beta = 0.175$) are positive and significant, **complementary partial mediation** is established. H5 is fully supported.

Moderation Test (H6)

The interaction term (DFF x DFL) exerted a statistically significant positive effect on Perceived Creditworthiness ($\beta = 0.168$, $t = 4.000$, $p < 0.001$, $f\text{-squared} = 0.048$).

To visualize this moderation, simple slope analysis was performed at three levels of Digital Financial Literacy: Mean DFL, Low DFL (-1 SD), and High DFL (+1 SD).



As illustrated in the simple slope plot:

- At **High DFL (+1 SD)**, the positive impact of DFF on PCW is strongest ($\beta = 0.593$, $p < 0.001$).
- At **Low DFL (-1 SD)**, the positive impact of DFF on PCW is substantially attenuated ($\beta = 0.257$, $p < 0.01$).

This empirically verifies that manager-level digital financial literacy amplifies the credit-signaling efficiency of raw transaction footprints, supporting H6.

6.4 Model Predictive Relevance (R-squared and Q-squared)

Table 4: Explanatory and Predictive Relevance Metrics

Endogenous Construct	R ² Value	Adjusted R ²	Q ² _predict PLS	Q ² _predict LM	Predictive Power
Perceived Creditworthiness (PCW)	0.482	0.478	0.412	0.385	High Out-of-Sample
Credit Access (CA)	0.541	0.538	0.485	0.442	High Out-of-Sample
Business Performance (BP)	0.395	0.392	0.321	0.298	High Out-of-Sample

The model accounts for **54.1% of the variance in Credit Access (R-squared = 0.541)** and **39.5% of the variance in Business Performance (R-squared = 0.395)**. PLSpredict analysis confirmed high out-of-sample predictive capability, as all PLS-SEM item prediction errors (RMSE) were consistently lower than the naive linear model (LM) benchmarks.

7. Discussion

7.1 Theoretical Contributions

This study advances literature at the intersection of Information Systems, FinTech, and Entrepreneurship in emerging economies in three key ways:

1. **Operationalizing DFF as Alternative Collateral:** Moving beyond binary adoption metrics, this study establishes DFF as a robust, multidimensional construct (*Consistency, Duration, Diversity, Retrievability*). It empirically proves that unstructured electronic transaction metadata serves as an effective **informational collateral** that mitigates traditional credit market frictions in informal economies.
2. **Validating Signaling Mechanisms in Opaque Markets:** By applying Signaling Theory to FinTech metadata, we show that continuous digital payment activity provides a credible signal of cash flow stability. This offers an alternative mechanism to formal accounting statements and real estate collateral.
3. **Identifying Capability-Driven Boundary Conditions:** Integrating the Resource-Based View reveals that raw digital footprint data requires managerial capability (**Digital Financial Literacy**) to achieve maximum signaling value. High-DFL entrepreneurs act as effective signallers who structure and communicate their transaction histories to overcome lender scepticism.

8. Policy and Managerial Implications

8.1 Policy Guidelines for Regulators and Financial Institutions

- **Bank of Ghana & Central Banks:** Regulators should formalize Open Banking APIs that allow informal entrepreneurs to securely export verified Mobile Money statements directly to licensed microfinance institutions and credit scoring agencies without incurring prohibitive fees.
- **Tier-1 Banks and Microfinance Institutions:** Lenders should transition from rigid collateral-based underwriting to cash-flow-based algorithmic scoring models that explicitly incorporate transaction consistency and wallet duration.

8.2 Actionable Strategy for Informal Business Owners

1. **Separate Business and Personal Wallets:** Informal entrepreneurs should register dedicated Merchant MoMo wallets (e.g., MTN PayPoint / Merchant ID) to eliminate noise and clearly signal business cash flows.
2. **Minimize Cash Cash-Outs:** Retaining liquidity within the digital financial ecosystem to settle supplier payments and utilities increases footprint *diversity* and *consistency*, strengthening credit profiles.

9. Conclusion, Limitations, and Future Research

This study demonstrates that digital financial footprints generated via Mobile Money and FinTech tools offer a scalable solution to the long-standing credit access challenge facing informal enterprises in Sub-Saharan Africa. When coupled with high digital financial literacy, transaction trails reduce information asymmetry, build perceived creditworthiness, unlock credit access, and drive firm performance.

Limitations and Future Directions

1. **Cross-Sectional Design:** While PLS-SEM provided strong explanatory insights, future research should utilize longitudinal panel datasets to observe how financial footprint accumulation dynamically impacts credit limits over multiple years.

2. **Geographic Expansion:** Replicating this model across other developing FinTech hubs (e.g., Kenya, Nigeria, Indonesia) will enhance comparative generalizability across different macroeconomic and regulatory environments.

References

1. Abdulai, A., et al. (2024). Financial inclusion and informal enterprise growth in West Africa. *Journal of Development Economics*, 158, 103112.
2. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
3. Frimpong, S., et al. (2022). Mobile money adoption and micro-enterprise performance in Ghana. *Telecommunications Policy*, 46(8), 102380.
4. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3rd ed.). SAGE Publications.
5. Kazimoto, P., & Baadel, S. (2025). Digital transaction trails as alternative credit scoring tools in sub-Saharan Africa. *Information Technology for Development*, 31(2), 215-238.
6. Kraha, A., et al. (2024). Firm performance metrics in informal sector surveys. *African Development Review*, 36(1), 45-59.
7. OECD/INFE (2024). *Toolkit for Measuring Digital Financial Literacy and Financial Inclusion*. OECD Publishing.
8. Sanga, D., et al. (2025). Re-imagining creditworthiness in informal markets. *Journal of Business Venturing Insights*, 23, e00412.
9. Spence, A. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3), 355-374.
10. Tigges, M., et al. (2024). FinTech footprints and SME financing in emerging markets. *Journal of Corporate Finance*, 84, 102510.
11. World Bank (2022). *Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19*. World Bank Group.
12. Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2), 197-206.