

ROLE OF DIGITAL FINANCIAL INTERMEDIARIES IN PROMOTING DIGITAL FINANCIAL LITERACY AMONG WOMEN

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Abstract

This research is aimed at examining the impact of Digital Financial Intermediaries (DFIs) on promoting Digital Financial Literacy (DFL) in women in India, as gender differences in financial inclusivity and swift digitalization of financial services persist. The mixed-methods cross-sectional design with 180 women respondents with multiple linear regression analysis shows that consistent DFI use is the most predictive of increased DFL levels ($\text{Beta} = 1.38, p < 0.001$), which explains 86.1% of the variance when considering the socio-demographic factors. K-means cluster analysis reveals that there are three different profiles of barriers: high barriers (digital skills deficits, language issues, fraud fears, and family/social restrictions) in married middle-aged women; moderate barricades in self-employed urban populations; and low barricades in educated semi-urban women. The results indicate the potential of DFIs to boost DFL with the help of learning-by-doing concepts and emphasize the need to develop specific and gender-sensitive intervention strategies such as training locally, simplifying interfaces, conducting fraud awareness campaigns, and providing sociocultural support to foster inclusive and equal digital financial ecosystems.

Keywords: Digital Financial Intermediaries, Digital Financial Literacy, Gender Gap

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INTRODUCTION

The financial literacy is generally accepted as a key factor of personal financial health and stable economic growth. At the microeconomic level, it allows making well-informed choices on saving, borrowing, investment, and risk management and, thus, promoting family welfare and long-term financial stability (Lusardi & Mitchell, 2014). On the macroeconomic level, financially literate populations lead to the presence of efficient financial markets, an increased level of financial stability, and inclusive economic growth (OECD, 2018). In line with this, financial literacy has emerged as one of the top policy concerns in both developed and developing economies.

The world of financial institutions has been changed due to the rapid innovations in digital technologies. Mobile money, digital wallets, online banking, fintech lending, and digital insurance are digital financial services that have increased access to finance by reducing transaction costs and reaching out to previously marginalized populations (Demirguc-Kunt et al., 2022; Goyal et al., 2024). Nonetheless, the digitalization has also made the financial decision-making process more complicated and brought forth new risks concerning cybersecurity, safety of data, and cyber-fraud.

It has resulted in the emergence of digital financial literacy (DFL), a set of skills and knowledge additions to traditional financial literacy to enable people to use the digital financial services safely and effectively. DFL entails the capability to negotiate digital interfaces, comprehending digital transactions and fees, handling digital identities and identifying online fraud and cyber threats (OECD, 2020; Morgan et al., 2019). As opposed to traditional financial literacy, DFL displays the combination of financial decision-making and digital proficiency.

The access and benefits are uneven even though the digital financial services have expanded. In financial inclusion, gender differences are still present, especially in low- and middle-income nations, where women are more unlikely to own bank accounts, make digital payments, and/or use formal credit (World Bank, 2022). The absence of these gaps is caused by structural and socioeconomic factors, including reduced education, reduced participation in the labor market, and limited possession of assets as well as a set of restricted sociocultural norms (Klapper & Singer, 2017).

Gender gap is also heightened in the digital space. Women are less likely to have access to smartphones, internet, and higher digital skills and this curtails their use of digital financial services (GSMA, 2023). Consequently, women become victims of two forms of exclusion, one of which is financial systems and the other is the digital technologies. Notably, the access does not guarantee meaningful inclusion. A lack of proper DFL can lead to people inappropriately using financial products, uninterested in services, or exposed to fraud and fake news (Morgan and Long, 2020; Ghosh et al., 2021; Goyal et al., 2025).

In this context, Digital Financial Intermediaries (DFIs) such as fintech companies, mobile money operators, digital wallets, payment banks and digital microfinance institutions become particularly important. DFIs define not only access to finance by providing services in technology-based, user-centric platforms, but also how users learn, interact with, and trust digital financial systems (Bazarbash & Beaton, 2020). DFIs might encourage DFL with the help of learning-by-doing, agent-assisted models, community outreach, and behavioral design features, including in-app guidance and reminders (Suri & Jack, 2016; Allen et al, 2016; Karlan et al., 2016).

Nonetheless, the usefulness of DFIs to boost DFL is limited to the ease of use of the platform, language availability, consumer rights, and regulatory controls. Bad interface design and weak complaint systems may deepen marginalization especially to low-literacy users (Zins & Weill, 2016). Women attitude and involvement in digital finance are further influenced by sociocultural issues, such as power relations in the household, and privacy, as well as by the institution trust (Demirguc-Kunt and Klapper, 2013). Despite the useful information found in the available literature on the subject of financial literacy, digital finance, and gender inclusion, there are a number of gaps. To start with, a significant part of the empirical literature addresses the question of access and adoption of digital financial services, whereas digital financial literacy is frequently regarded as a by-product or even a by-processor of analytical constructs. Second, the existing gendered analysis of DFL is scarce, especially in the LMIC environment where digital finance penetration is growing fastest.

Third, though DFIs are often referred to as the promoters of financial inclusion, their potential as the agents of digital building of financial capabilities in women is little researched. The available literature is more likely to focus on individual processes, like the use of mobile money or the systems of agents and does not measure the effect of combinations of DFI features on the digital financial literacy of women. Lastly, the contextual conditions of DFIs that lead to success or failure in improving DFL in women have little knowledge; this is by platform design, sociocultural norms, and institutional trust.

1. These gaps are crucial to fill in the gaps to promote theory and shape up policy interventions to create gender responsive digital financial ecosystems. This study measures the level of Digital Financial Literacy among women users and non-users of Digital Financial Intermediaries.
2. To explore the barriers that limit the effectiveness of Digital Financial Intermediaries in enhancing Digital Financial Literacy among women through qualitative inquiry.

All in all, digital financial literacy is an essential ability in digital financial systems, and women are one of the main target audiences. DFIs are at the center of influencing women to gain financial knowledge, skills, and confidence; they are the main interactions between users and digital finance. They are important to comprehend their part in creating inclusive, safe, and gender-equitable digital financial ecosystems.

2. LITERATURE REVIEW

Financial literacy and its evolution in the digital era

Financial literacy is widely acknowledged as a very important factor of sound financial decision-making and economic welfare. It can be defined as the capability to perceive the fundamentals of financial concepts like interest, inflation, and diversification of risks and translate them into actual life (Lusardi and Mitchell, 2014). Empirical literature associates greater financial literacy with better saving behaviour, responsible borrowing and better retirement planning, and at the macro level, it helps to make the financial market more stable and resilient (Van Rooij et al., 2011; OECD, 2018).

The accelerated pace of digitalisation of financial services has broadened this notion and accredited the emergence of digital financial literacy (DFL). The traditional financial literacy would fall short in an environment that is filled with mobile payments, digital lending, and platform-based finance. DFL combines monetary literacy with digital skill and entails the understanding of risks, including information privacy violations, cybersecurity, and Internet fraud (Morgan et al., 2019; OECD, 2020). The conceptualisation of DFL in recent literature

is that it is a multidimensional concept including technical competencies, transactional knowledge, and protection abilities, especially in emerging markets where fintech usage usually outpaces user comprehension (Lyons & Kass-Hanna, 2021; Ghosh et al., 2021).

Gender, digital capability, and financial inclusion

It is still an established fact that persistent gender disparities in financial inclusion exist particularly in the low- and middle-income nations. Females have reduced chances to have bank accounts, receive formal credit, and engage with financial products because of the structural incapacity to access higher income, fewer assets, and limited social norms (Klapper and Singer, 2017; Duflo, 2012). Though digital finance can minimize such barriers, it has been demonstrated that it tends to recreate or increase existing inequalities because women tend to be less inclined to own a smartphone, use the internet, or have higher levels of digital skills (World Bank, 2022; GSMA, 2023).

Research has noted that low DFL means that women are less likely to continue using digital financial services and more vulnerable to fraud and misinformation, losing trust in digital finance platforms (Morgan and Long, 2020; Lyons and Kass-Hanna, 2021).

Role of Digital Financial Intermediaries

DFIs (digital financial intermediaries) such as fintech and mobile money providers, digital wallets, digital microfinance institutions, and so on are at the heart of determining the financial capacities of their users. DFIs also impact access and behaviour as well as learning by facilitating continuous digital interaction (Bazarbash & Beaton, 2020). Learning-by-doing tools allow users to develop skills by using digital payments and savings tools repeatedly and gaining confidence and better financial management as time goes by (Suri & Jack, 2016; Hasan et al., 2022; Goyal et al., 2025).

Models with agents (especially female agents) can be useful in developing trust and informal financial education to women who have low levels of literacy or had no financial experience before (Allen et al., 2016). Moreover, behavioural design elements (nudges, reminders, simplified interfaces, etc.) can support the process of engagement and skill building, whereas poorly designed platforms can support exclusion (Karlan et al., 2016; Zins & Weill, 2016; Goyal et al., 2025).

Risks, trust, and consumer protection

DFIs also present users with risks such as cyber fraud, misuse of their data, opaque prices, and algorithmic bias despite their potential. Little experience with digital devices makes women especially vulnerable to vulnerability, and trust and consumer protection are especially important as mediating factors (Ghosh et al., 2021; Morgan et al., 2019). They must have transparent pricing, avenues of complaints and good regulatory checks to facilitate trust and learning. The international policy frameworks highlight the need to incorporate the consumer protection and literacy goals in digital financial ecosystems with the aim of achieving inclusive and sustainable results (Demirguc-Kunt and Klapper, 2013; OECD, 2020).

3. MATERIAL AND METHODS

Research Design

This study is cross-sectional research design with a mixed-method focus to determine how Digital Financial Intermediaries (DFIs) can facilitate Digital Financial Literacy (DFL) among women in India. The mixed-methods methodology is suitable because it will allow combining the quantitative assessment of DFL outcomes with qualitative data on the structural and behavioral constraints that affect the effectiveness of DFI. The cross-sectional design cuts across changes in levels of DFL and experiences at one moment in time, which is in line with the empirical research in financial literacy and digital inclusion research.

Population and Sampling

The population comprises of Indian women between the ages of 18 and above. The population was stratified, depending on the usage of DFI (users and non-users), age brackets, educational level, and residence location (rural, semi-urban, and urban) to make it representative. Purposive stratified sampling methodology was used in an attempt to have sufficient representation in these strata. A total of 180 respondents were chosen to make the final sample with equal representation of DFI users and non-users.

Power analysis of a multiple regression (effect size $f^2 = 0.15$, level of significance $\alpha = 0.05$, and power = 0.80) was used to determine that the minimum required sample was 150 observations.

Data Collection Methods

This study captured socio-demographic characteristics, DFI usage patterns, digital access, financial behaviors, perceived usefulness of DFIs, and multiple dimensions of digital financial literacy. Prior approval was obtained prior to data collection. Participation was voluntary, and **informed consent** was obtained from all respondents. Anonymity and confidentiality were strictly maintained, and data were used solely for academic research purposes.

4. RESULTS AND DISCUSSION

The validity and reliability of the questionnaire were rigorously assessed using standard psychometric procedures. Table 1 depicts the validity and reliability of the instrument.

Table 1: Reliability and validity

Aspect	Method	Results
Content Validity	Expert review (3 subject experts)	Content Validity Ratio (CVR) > 0.80
Face Validity	Feedback from pilot respondents	Confirmed
Construct Validity	Exploratory Factor Analysis (pilot data)	KMO = 0.79; Bartlett's Test $p < 0.001$; 68% variance explained; factor loadings > 0.60
Internal Consistency	Cronbach's Alpha	Section B: 0.82; Section C: 0.78; Sections D–F (DFL): 0.89 (subscales 0.81–0.87); Section G: 0.84; Section H: 0.88; Section I: 0.76
Test–Retest Reliability	Intra-class Correlation Coefficient (two-week interval)	ICC > 0.75 (n = 15)

All measures exceeded commonly accepted threshold values, indicating **good to excellent validity and reliability**. These results confirm the suitability of the instrument for measuring digital financial literacy and related constructs among women.

Quantitative data were analyzed using **descriptive statistics, multiple linear regression, and K-means cluster analysis**. Regression analysis examined the relationship between DFI usage and DFL while controlling for demographic variables. Cluster analysis was employed to identify distinct barrier profiles affecting women's engagement with DFIs.

Qualitative data from open-ended responses and interviews were analyzed using **thematic analysis**, following systematic coding, categorization, and interpretation to triangulate and enrich quantitative findings.

5. RESULTS AND INTERPRETATION

Analysis

Measuring the Level of Digital Financial Literacy (DFL) Among Women Users and Non-Users of Digital Financial Intermediaries (DFIs)

To address the first objective, we measured DFL levels using a composite score derived from questionnaire, which cover technical skills, financial and transactional knowledge, and risk awareness and protection, respectively. The DFL score was calculated as the average of the 12 items across these sections (on a 5-point Likert scale), with higher scores indicating greater literacy.

Among the 180 respondents, 111 (61.7%) were classified as DFI users (defined as those with an average score >3 on Section B items, indicating regular exposure to DFIs), while 69 (38.3%) were non-users. Descriptive statistics revealed a notable difference in DFL levels: users had a mean DFL score of 3.92 (SD = 0.52), compared to 2.54 (SD = 0.61) for non-users. This suggests that women engaging with DFIs exhibit substantially higher digital financial literacy.

To further examine this relationship while controlling for socio-demographic factors (from Section A), we conducted a multiple linear regression analysis with DFL as the dependent variable and DFI user status (binary: 1 = user, 0 = non-user) as the key independent variable. Control variables included age group, education, marital status, employment, income, place of residence, device ownership, and internet access, all dummy-coded with the first category as reference.

The regression model explained 86.1% of the variance in DFL ($R^2 = 0.861$, adjusted $R^2 = 0.836$, $F(27, 152) = 34.78$, $p < 0.001$). The coefficient for DFI user status was highly significant ($\beta = 1.38$, $SE = 0.05$, $t = 28.31$, $p < 0.001$), indicating that being a DFI user is associated with a 1.38-point increase in DFL score, holding all else constant. Among controls, private sector employment showed a positive effect ($\beta = 0.19$, $p = 0.012$), while self-employment was marginally significant ($\beta = 0.14$, $p = 0.052$). Other demographics, such as age, education, and internet access, did not significantly predict DFL after accounting for user status. The model diagnostics (e.g., Durbin-Watson = 2.01) indicated no major autocorrelation issues, though residuals showed some non-normality (Omnibus = 79.49, $p < 0.001$), suggesting robustness for interpretation in this context.

These findings confirm that DFI usage is a strong predictor of higher DFL among women, independent of socio-demographic influences.

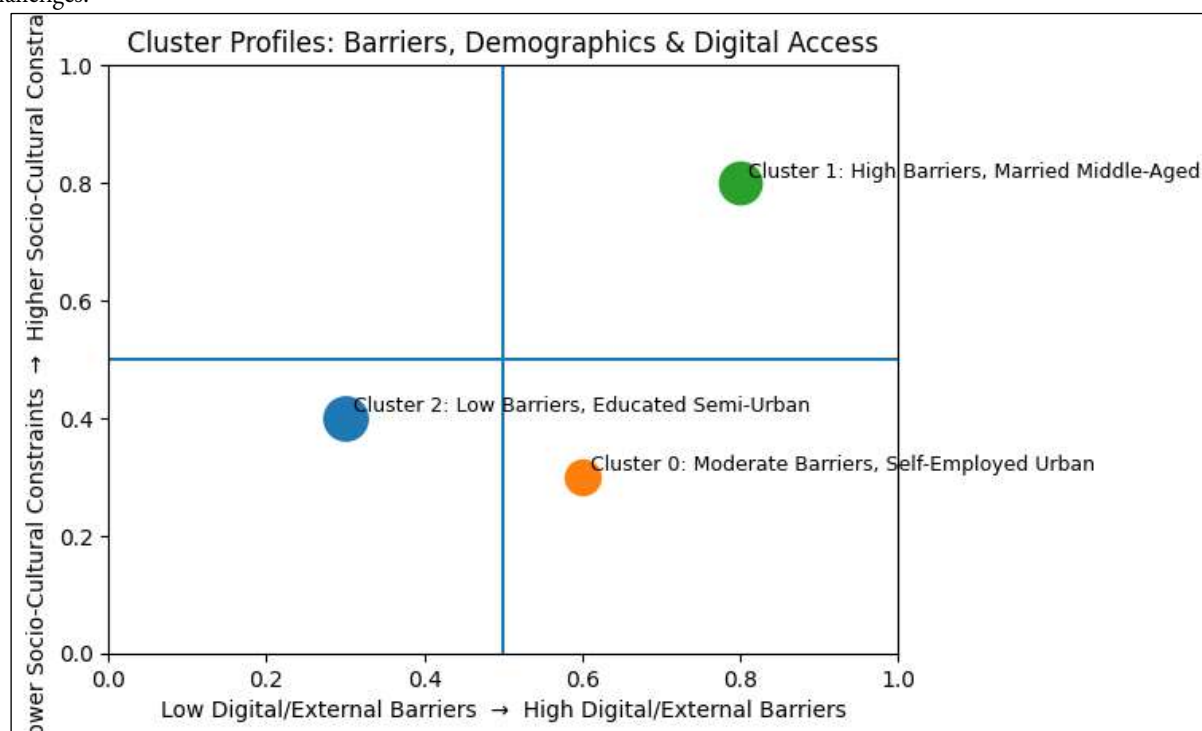
Exploring Barriers Limiting DFI Effectiveness for Women

For the second objective, we employed cluster analysis to quantitatively explore barriers (Section I: lack of digital skills, language barriers, fear of fraud, and family/social restrictions) and identify distinct respondent groups, incorporating socio-demographic profiles for deeper insight. This approach complements qualitative inquiry by segmenting the sample into homogeneous groups based on barrier perceptions and backgrounds, allowing for targeted exploration of constraints.

Using K-means clustering (k=3, selected via elbow method for optimal separation), we clustered respondents based on the four barrier items (Likert 1-5, higher = stronger barrier) and dummy-coded demographics. The algorithm yielded three clusters with the following sizes: Cluster 0 (n=45, 25%), Cluster 1 (n=65, 36.1%), and Cluster 2 (n=70, 38.9%).

Cluster	n	Mean I41 (Lack of Digital Skills)	Mean I42 (Language Barriers)	Mean I43 (Fear of Fraud)	Mean I44 (Family/Social Restrictions)
0	45	2.47	2.24	2.78	1.40
1	65	4.12	4.05	3.95	4.12
2	70	1.83	1.73	1.70	2.16

- **Cluster 0 (Moderate Barriers, Self-Employed Urban Group):** This group reports moderate agreement with barriers, particularly fear of fraud (mean=2.78), but low family/social restrictions (1.40). Demographically, they are younger (28.9% aged 25-34), with secondary education (33.3%), self-employed (42.2%), low-income (42.2%), urban (48.9%), and reliant on shared smartphones (26.7%) with occasional internet (26.7%). This suggests barriers stem from moderate digital access issues, potentially limiting DFI effectiveness despite urban advantages.
- **Cluster 1 (High Barriers, Married Middle-Aged Group):** Respondents here strongly agree with all barriers (means ~4), indicating severe constraints. They are middle-aged (29.2% aged 35-44, 9.2% 55+), undergraduate-educated (33.8%), married (63.1%), self-employed (36.9%), middle-income (35.4%), urban/semi-urban (43.1%/26.2%), with personal smartphones (44.6%) but rarer internet access (16.9%). High family/social restrictions (4.12) and fear of fraud (3.95) highlight socio-cultural and trust-related hurdles, making DFIs less effective for this vulnerable segment.
- **Cluster 2 (Low Barriers, Educated Semi-Urban Group):** This cluster shows low barrier agreement (means 1.7-2.2), with slightly higher family restrictions (2.16). They are younger/educated (37.1% undergraduate), unemployed/homemakers (21.4%/not specified but low self-employed 17.1%), no-income (28.6%), semi-urban (31.4%), with strong personal smartphone access (55.7%) and occasional internet (30.0%). Low barriers imply DFIs are more effective here, possibly due to better device access despite income challenges.



Source: Author's own computation based on primary survey data (N = 180)

Overall, the clusters reveal that barriers are not uniform: high-barrier groups (Cluster 1) face intertwined socio-cultural and trust issues, often among married middle-aged women, while low-barrier groups (Cluster 2) benefit from better digital infrastructure. These insights suggest targeted interventions, such as localized tutorials or fraud awareness campaigns, to enhance DFI effectiveness for women facing specific constraints.

6. CONCLUSION AND ACKNOWLEDGEMENT

This study shows that women who regularly use **digital financial services** (like mobile banking or digital wallets) are much better at understanding and using them safely. These women scored much higher in **digital financial knowledge** (average 3.92 out of 5) compared

to those who don't use them (only 2.54). Even after considering age, education, income, and other factors, using these services was the biggest reason for their better knowledge.

We also found that not all women face the same problems. Some (especially married, middle-aged women) struggle a lot with lack of skills, language issues, fear of being cheated, and family restrictions. Others (younger, educated women in semi-urban areas) face very few problems and use these services easily.

The good news is that using digital financial services really helps women learn and become confident. But to include more women, we need simple training in local languages, clear warnings about fraud, easy-to-use apps, and support to reduce family restrictions. This way, more women can safely manage their money and become financially stronger.

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