

“Shaping digital financial wellbeing through digital financial literacy and financial inclusion: Evidence from gender and residential groups in India”

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SHAPING DIGITAL FINANCIAL WELLBEING THROUGH DIGITAL FINANCIAL LITERACY AND FINANCIAL INCLUSION: EVIDENCE FROM GENDER AND RESIDENTIAL GROUPS IN INDIA

Abstract

Financial inclusion has become a critical driver of inclusive growth; however, disparities in digital access, literacy, and usage limit improvements in financial well-being, particularly across gender and residential groups. This study examines how digital financial literacy influences digital financial inclusion and financial wellbeing among digital consumers in the Delhi National Capital Region of India. This study employed an online structured survey administered between August and October 2025, yielding a sample size of 431. Using structural equation modelling, the results indicate that infrastructure accessibility ($\beta = 0.521$), knowledge and awareness ($\beta = 0.379$), digital financial skills ($\beta = 0.277$), motivation and attitude ($\beta = 0.223$), and social and institutional support ($\beta = 0.215$) significantly enhance digital financial literacy (all $p < 0.001$). Digital financial literacy strongly influences digital financial inclusion ($\beta = 0.684$, $p < 0.001$) and financial wellbeing ($\beta = 0.509$, $p < 0.001$), whereas digital financial inclusion further improves financial wellbeing ($\beta = 0.479$, $p < 0.001$). The indirect effect of digital financial literacy on financial wellbeing through digital financial inclusion is also significant ($\beta = 0.328$, $p < 0.001$). Necessary condition analysis confirmed that all five antecedents are essential for achieving higher digital financial literacy levels. Descriptive and ANOVA analyses reveal significant mean-level differences across gender and residential groups, providing evidence that these demographic factors condition the digital financial outcomes. The findings highlight that digital financial literacy and infrastructure are central to enhancing financial wellbeing, with implications for the design of gender-sensitive and context-responsive financial inclusion policies.

Keywords

financial skills, gender, inclusion, infrastructure
accessibility, literacy

JEL Classification

G53, G51, O16

INTRODUCTION

The rapid advancement of digital technologies has fundamentally transformed financial systems, leading to the expansion of digital financial services such as mobile banking, internet banking, and digital wallets. These developments have facilitated the extension of financial services to underserved populations, giving rise to digital financial inclusion (Tay et al., 2022). As part of this digital transformation, digital financial literacy (DFL) has emerged as a critical enabler. However, the expansion of digital financial services does not automatically translate into improved financial outcomes. The effective use of these services depends on whether individuals possess the competencies to navigate digital platforms confidently and make sound financial decisions, a capacity captured by the concept of digital financial literacy (DFL). Digital financial inclusion (DFI), in turn, refers to the accessibility

and active use of digital financial tools by previously underserved populations and has been shown to enhance financial decision-making, promote entrepreneurial activity, and improve income and overall financial wellbeing (FWB) (Hasan et al., 2023). Yet access alone is insufficient: the welfare benefits of DFI are contingent on the quality of literacy that individuals bring to these platforms.

This distinction is particularly consequential in the Indian context. Despite the rapid proliferation of mobile banking, internet banking, and digital wallet infrastructure, several structural challenges persist, including the rural-urban digital divide, inadequate digital infrastructure, limited financial knowledge, and rising cybersecurity risks that constrain the welfare-enhancing potential of DFI, especially in developing economies (Afzal et al., 2025). Financial exclusion has long been associated with unemployment, income inequality, regional disparities, and gender inequity, reinforcing cycles of economic marginalization (Mwakalila & Muba, 2025). Consequently, DFI has attracted sustained policy and academic attention, with governments and banking institutions increasingly investing in digital financial initiatives as instruments of inclusive growth (Shaikh et al., 2023). Nevertheless, significant disparities in digital financial access and usage persist across gender, residential location, and socioeconomic groups (Kulkarni & Ghosh, 2021), and prior research indicates that structural factors such as internet penetration, mobile access, educational attainment, income levels, and savings behavior are important determinants of DFI outcomes in India (Lenka & Barik, 2018).

Against this backdrop, the scientific problem motivating the present study can be stated clearly. While existing research has examined DFL, DFI, and FWB individually or in partial combinations (Bhat et al., 2024), three critical gaps remain. First, the multidimensional antecedents of DFL, including infrastructure access, knowledge, skills, motivation, and institutional support, have not been tested as an integrated set of drivers within a unified structural model. Second, the sequential pathway through which DFL shapes DFI, and through which DFI further enhances FWB, requires empirical validation that goes beyond bivariate associations to establish mediation. Third, the extent to which gender and residential location condition these relationships remains underexplored in the post-pandemic Indian context (Pandey et al., 2022), where digital financial adoption has accelerated rapidly but unevenly. Addressing these gaps matters practically: without a clear understanding of which literacy antecedents matter most and how demographic and geographic context conditions outcomes, policy interventions risk misallocating resources or overlooking the populations most in need.

To address these gaps, the present study pursues three objectives: to identify the key antecedents of DFL; to examine how DFL drives DFI and, in turn, enhances FWB; and to examine mean-level differences in DFL, DFI, and FWB across gender and residential groups among digital consumers in the Delhi-NCR region of India, as preliminary evidence of demographic conditioning effects. Using partial least squares structural equation modelling (PLS-SEM) and necessary condition analysis (NCA), the study offers an integrated empirical account of the pathways through which digital financial literacy and inclusion contribute to financial wellbeing. The findings carry both theoretical and practical significance, contributing to the growing literature on digital financial ecosystems while informing the design of gender-sensitive and context-responsive financial inclusion policies.

1. LITERATURE REVIEW AND HYPOTHESES

The rapid integration of digital technologies into financial systems has reshaped the landscape of economic participation, particularly in emerging economies. While substantial research has examined digital financial literacy and financial

inclusion independently, growing attention is now directed toward digital financial literacy as a foundational capability within digital financial ecosystems. DFL refers to the understanding and comprehension necessary to negotiate financial services online (Koskelainen et al., 2023). Digitally and financially literate individuals can use online financial tools and services more skillfully, thus

making better financial decisions. Moreover, understanding digital financial services is essential to promote inclusive financial engagement (Afjal, 2023), where better-informed individuals on available digital tools tend to use them more efficiently. As such, knowledge and awareness (KA) have a central role to play in strengthening DFL and equitable access to financial services in the digital age (Kyeyune & Ntayi, 2025). The development of digital and financial skills (DFS) is integral to enhancing DFL. Digital skills enable individuals to interact with financial technologies, while financial skills empower them to make informed financial decisions (Kumar et al., 2023). Individuals with strong DFS are better equipped to navigate the complexities of digital financial platforms (Marconi et al., 2025). Digital infrastructure, including the internet and digital devices, directly influences an individual's capacity to access digital financial services (Andaregie et al., 2024). Shatila et al. (2025) highlight the importance of digital literacy and access in enhancing entrepreneurial resilience by indicating that the more access to digital infrastructure, the more they may develop DFL. Nonetheless, the infrastructure accessibility (IA) can also increase inequalities, preventing the transmission of digital financial skills to marginalized groups (Ho & Ho, 2025).

The perception and attitude of people towards such technologies generally determine how willing people are to use the digital financial services (Appiah & Agblewornu, 2025). According to Chhillar et al. (2025), negative perceptions towards digital finance may be a barrier to the implementation of DFL, and attitudinal interventions are necessary. Moreover, such intrinsic motivation and attitude (MA) as financial empowerment can stimulate interest towards receiving and using digital financial tools (Chaurasia et al., 2019). Family, peer, and community network support can improve individual confidence and competence in using digital financial services (Silinskas et al., 2023). Also, the necessary resources and assistance can be given to individuals by institutional support in the form of policies, educational programs, and available services. According to Uthaileang and Kiattisin (2023), behavior change theory is significant in determining relevant variables to establish positive motivational aspects, which in turn implies that institutions can introduce the DFL ef-

fectively. Thus, it is highly important to enhance social and institutional support (SIS) systems to drive DFL and inclusive financial participation (Pandey et al., 2022). DFL interacts with DFI and, to a great extent, affects financial wellbeing (FWB). DFL provides competencies and skills to engage (Choung et al., 2023), and DFI facilitates access to digital financial services (Kamboj & Sharma, 2025). Coupled together, they help people to manage their finances positively, which results in a better financial performance. Kamble et al. (2024) determined that the interconnectedness of DFI and DFL shows that both have a significant positive effect on FWB. Thus, to improve FWB and to secure equitable access to financial services, it is critical to encourage DFL and promote DFI.

Recent literature highlights the significant influence of gender and residential status on DFL, DFI, and FWB (Tulcanaza-Prieto et al., 2025). Kamble et al. (2024) emphasize that both DFI and DFL play critical roles in enhancing FWB, suggesting that individuals with higher digital competencies are better positioned to access and utilize financial services effectively. Similarly, Tze-Lin et al. (2025) examine Malaysian households and demonstrate that DFI mediates the relationship between gender and FWB, indicating that women often face barriers in accessing digital financial tools despite possessing basic financial knowledge. Gammage et al. (2017) argue that gender disparities in DFI persist globally due to socio-cultural norms and structural inequities, highlighting a knowledge gap in how digital tools are adopted differently by men and women. Focusing on the Indian context, Mishra et al. (2024) reveal that DFL significantly impacts women's financial decision-making, emphasizing the need for targeted interventions to bridge gender gaps. Similarly, Rahayu et al. (2023) find that DFL enhances women's economic empowerment in West Sumatera, underlining the transformative potential of technology-enabled financial education. Residential status plays a pivotal role, as Wu and Zhang (2025) show that DFI strengthens rural inhabitants' resilience. Koomson et al. (2020) indicate that broader access to financial services reduces poverty and vulnerability, particularly in marginalized communities. Collectively, these studies underscore that gender and residential differences are critical determinants of DFL, DFI, and ultimately, FWB.

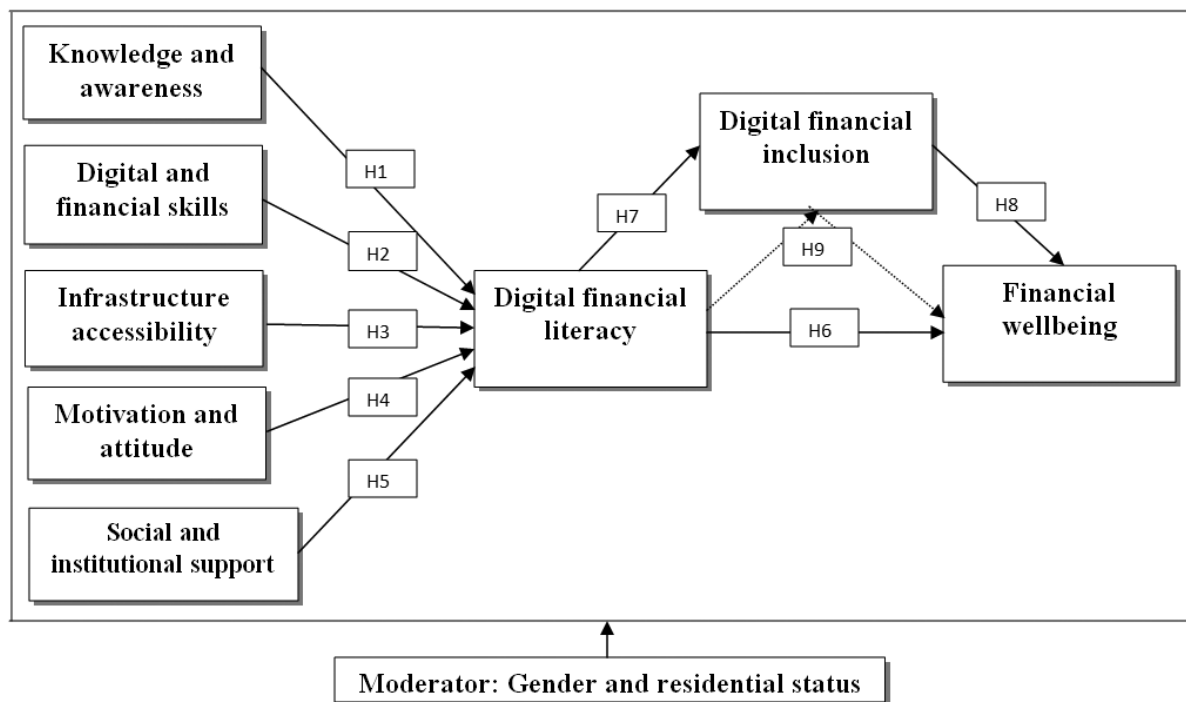


Figure 1. Theoretical framework

Existing literature demonstrates that digital financial literacy plays a pivotal role in enabling digital financial inclusion and enhancing financial wellbeing. However, gaps remain regarding the integrated examination of its multidimensional drivers, the necessity of these drivers, and the extent to which demographic and residential status condition these relationships. Addressing these gaps is essential for understanding how digital financial ecosystems can generate inclusive and equitable welfare outcomes.

The purpose of this study is to examine the determinants of digital financial literacy and to analyze how digital financial literacy influences digital financial inclusion and financial well-being, while examining the extent to which gender and residential status condition mean-level differences in DFL, DFI, and FWB. The theoretical framework is shown in Figure 1, and the following hypotheses are developed accordingly:

- H1: Knowledge and awareness have a positive influence on digital financial literacy.*
- H2: Digital and financial skills have a positive influence on digital financial literacy.*

- H3: Infrastructure accessibility has a positive influence on digital financial literacy.*
- H4: Motivation and attitude have a positive influence on digital financial literacy.*
- H5: Social and institutional support has a positive influence on digital financial literacy.*
- H6: Digital and financial literacy has a positive influence on financial wellbeing.*
- H7: Digital financial literacy has a positive influence on digital financial inclusion.*
- H8: Digital financial inclusion has a positive influence on financial wellbeing.*
- H9: Digital financial inclusion mediates the impact of digital financial literacy on financial wellbeing.*

- H10: Gender is associated with significant mean-level differences in DFL, DFI, and FWB, providing preliminary evidence that gender conditions digital financial outcomes.*

H11: Residential status is associated with significant mean-level differences in DFL, DFI, and FWB, providing preliminary evidence that residential context conditions digital financial outcomes.

2. METHODOLOGY

The study investigates the multifaceted factors influencing the adoption and outcomes of digital financial services (DFS) among Indian households in the Delhi National Capital Region (NCR). The Delhi NCR region was selected for its representative socio-economic diversity (Rastogi et al., 2024). Constructs of interest were measured using a structured questionnaire designed on a five-point Likert scale. Measurement items for KA (Kanungo, 2025), DFS (Bhat et al., 2024), IA (Demirgüç-Kunt et al., 2022; Davis, 1989), MA (Mishra et al., 2024), and SIS (Asif & Sarwar, 2025) were adapted and modified from previous studies, while items for DFL, DFI, and FWB were adapted from Tze-Lin et al. (2025). A stratified random sampling approach was adopted to represent diverse demographics across the region, with a final usable sample of 431 households. Clear instructions and a concise introduction were provided to enhance comprehension and participation. Data was collected using a self-administered online questionnaire distributed via email. Participation was voluntary, and respondents were informed of the study's academic purpose.

Prior to the main data collection, a pilot study involving 50 respondents was conducted to evaluate the clarity, relevance, and reliability of the questionnaire items. Feedback from the pilot respondents resulted in minor modifications to im-

prove wording and contextual alignment with retail practices. Internal consistency reliability was evaluated through Cronbach's alpha and composite reliability values, while convergent validity was assessed using the Average Variance Extracted (AVE). Discriminant validity was evaluated through the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio (Hair et al., 2021). The results confirmed that all constructs satisfied the recommended thresholds, indicating satisfactory reliability and validity of the measurement instrument. Data analysis was conducted in two stages. First, SPSS was used to perform descriptive statistics and preliminary diagnostics, including data screening and demographic analysis. Subsequently, SmartPLS 4 was employed for Structural Equation Modeling (SEM) to examine hypothesized relationships among the constructs, including direct, indirect, and mediating effects (Hair et al., 2021). Additionally, necessary condition analysis was conducted to evaluate whether specific antecedent variables constitute required conditions for achieving higher levels of digital financial literacy. The analysis ultimately provided insights into the determinants of DFL and their effects on DFI and FWB, considering mediating and demographic conditioning influences.

2.1. Demographic profiles

The demographic profile of the respondents is presented in Table 1. The generational cohort data show that the majority of participants were aged between 21 and 30 years (35.3%), followed by those aged between 31 and 40 years (31.1%). In terms of gender distribution, male respondents (61.0%) outnumbered female respondents (39.0%), suggesting a statistically significant gender imbalance within the sample. Educational attainment

Table 1. Demographic characteristics

Characteristics	Description	Frequency	Percent
Age	Up to 20 Years	66	15.3
	21 to 30 Years	152	35.3
	31 to 40 Years	134	31.1
	41 to 50 Years	57	13.2
	More than 50 Years	22	5.1
Gender	Male	263	61
	Female	168	39
Marital Status	Unmarried	101	23.4
	Married	325	75.4
	Separated/Divorce	5	1.2

Table 1 (cont.). Demographic characteristics

Characteristics	Description	Frequency	Percent
Education Level	Under graduation	116	26.9
	Graduation	111	25.8
	Post Graduation	46	10.7
	Professional Qualification	107	24.8
	Vocational and other qualifications	51	11.8
Residential status	Rural	115	26.7
	Semi Urban	90	20.9
	Urban	226	52.4

varied across respondents, with undergraduates (26.9%) and graduates (25.8%) forming the largest groups, followed by those with professional qualifications (24.8%), showing a diverse educational background. Concerning residential status, over half of the respondents resided in urban areas (52.4%), while 26.7% lived in rural and 20.9% in semi-urban areas, suggesting that urban respondents were significantly more represented. Overall, the demographic profile demonstrates a youthful, male-dominated, and urban-oriented sample with varied educational qualifications, suitable for representing a heterogeneous population in the study context.

3. RESULTS

The descriptive statistics for the drivers of DFL and their influence on DFI and DFW are shown in Table 2. The results show that IA recorded the highest mean ($M = 4.044$, $SD = 0.77989$, $Var = 0.608$), indicating that respondents generally have strong access to digital infrastructure and find digital platforms user-friendly and affordable. FWB ($M = 4.119$, $SD = 0.51811$, $Var = 0.268$) and DFI ($M = 4.168$, $SD = 0.49290$, $Var = 0.243$) also show high means, suggesting that digital financial ser-

vices significantly enhance individuals' financial management, inclusion, and economic confidence. DFS ($M = 3.585$, $SD = 0.86624$, $Var = 0.750$) and SIS ($M = 3.922$, $SD = 0.51211$, $Var = 0.262$) reflect moderate agreement, emphasizing the role of competencies and supportive ecosystems. Conversely, KA ($M = 2.881$, $SD = 0.74606$, $Var = 0.557$) and MA ($M = 2.883$, $SD = 0.70348$, $Var = 0.495$) scored lower, suggesting limited awareness and motivation toward digital finance adoption. Factor loadings mostly exceeded the 0.70 threshold, confirming indicator reliability, though some items (e.g., 0.628, 0.635, and 0.646) loaded slightly below, possibly due to item heterogeneity, limited respondent familiarity, or contextual differences in digital literacy perceptions across socio-economic groups. Overall, the constructs demonstrate satisfactory reliability and internal consistency.

The measurement model results presented in Table 3 demonstrate satisfactory construct reliability and validity. All Cronbach's alpha (α) values exceed the recommended threshold of 0.70 (Hair et al., 2021). Similarly, composite reliability (ρ_c) values fall between 0.870 and 0.963, exceeding the minimum criterion of 0.70, further supporting the reliability of the constructs. The AVE values range from 0.543 to 0.866 above the recommend-

Table 2. Descriptive statistics

Constructs	Factor loading	Mean	Std. Deviation	Variance
Knowledge and Awareness	0.911-0.780	2.881	0.74606	0.557
Digital and Financial Skills	0.960-0.646	3.585	0.86624	0.750
Infrastructure Accessibility	0.873-0.891	4.044	0.77989	0.608
Motivation and Attitude	0.988-0.885	2.883	0.70348	0.495
Social and Institutional Support	0.882-0.635	3.922	0.51211	0.262
Digital Financial Literacy	0.851-0.628	3.541	0.43253	0.187
Digital Financial Inclusion	0.940-0.788	4.169	0.49290	0.243
Financial Wellbeing	0.929-0.615	4.119	0.51811	0.268

ed threshold of 0.50 (Fornell & Larcker, 1981), confirming that more than 50% of the variance in the indicators is explained by their respective constructs. Additionally, all Variance Inflation Factor (VIF) values are well below the cut-off value of 3.3 (Diamantopoulos & Siguaw, 2006), suggesting the absence of multicollinearity among indicators. The f-square (effect size) values indicate the magnitude of impact each predictor has within the model: KA (2.982) and MA (1.553) exhibit large effect sizes (Cohen, 2013), highlighting their substantial influence on DFL and DFI, while IA (0.775), DFS (0.878), and SIS (0.653) show medium-to-large effects, signifying meaningful contributions to the structural model. Overall, these results confirm that the measurement model meets the reliability and validity requirements, ensuring robustness for subsequent structural model analysis.

The results of the combined discriminant validity assessment demonstrated satisfactory construct validity. The diagonal elements (in bold) represent the square root of the AVE for each construct, while the upper triangular matrix reports the HTMT ratios and the lower triangular matrix shows the inter-construct correlations. As shown in Table 4, most HTMT values fall below the conservative threshold of 0.85. However, two pairs exceed this threshold: FWB-IA (0.897) and DFI-FWB (0.891), both of which approach but

remain below the more liberal threshold of 0.90 recommended by Gold et al. (2001) and applied in studies with theoretically related constructs (Henseler et al., 2015). Furthermore, the square root of the AVE for each construct exceeded its corresponding correlations with the other constructs, thereby satisfying the Fornell-Larcker criterion. Overall, as all diagonal elements exceed the inter-construct correlations, the model demonstrates satisfactory discriminant validity, in line with established guidelines (Fornell & Larcker, 1981; Hair et al., 2021).

Table 5 presents the model fit assessment, including R^2 , Q^2 predict, and model fit indices. The R^2 values for DFI (0.467), DFL (0.927), and FWB (0.822) indicate moderate to substantial explanatory power (Hair et al., 2021), demonstrating that the exogenous constructs explain a significant proportion of variance in the endogenous variables. The Q^2 predict values, all exceeding zero (0.488, 0.925, and 0.756), further confirm strong predictive relevance (Shmueli et al., 2016). Moreover, the low RMSE and MAE values (ranging from 0.275 to 0.720 and 0.222 to 0.577, respectively) suggest high prediction accuracy. Regarding the overall model fit, the SRMR value for the saturated model (0.093) is below the recommended cut-off of 0.10, indicating acceptable fit (Henseler et al., 2016). Although the NFI (0.658) is slightly below the ideal thresh-

Table 3. Construct reliability and validity

Constructs	Cronbach alpha	ρ_a	ρ_c	AVE	VIF	f-square
DFI	0.927	0.93	0.94	0.73	1.01	1.046
DFL	0.858	0.87	0.89	0.54	1.88	0.688
DFS	0.877	0.90	0.92	0.75	1.00	0.878
FWB	0.923	0.93	0.94	0.70	1.88	NA
IA	0.948	0.95	0.96	0.87	1.25	0.775
KA	0.877	0.88	0.92	0.73	1.27	2.982
MA	0.944	0.96	0.96	0.86	1.04	1.553
SIS	0.797	0.80	0.87	0.63	1.22	0.653

Table 4. Discriminant validity assessment (HTMT and Fornell-Larcker criterion)

	DFI	DFL	DFS	FWB	IA	KA	MA	SIS
DFI	0.857	0.746	0.042	0.891	0.746	0.497	0.208	0.482
DFL	0.684	0.737	0.444	0.829	0.833	0.747	0.319	0.674
DFS	0.014	0.337	0.863	0.161	0.068	0.043	0.049	0.067
FWB	0.827	0.836	0.122	0.834	0.897	0.712	0.148	0.499
IA	0.706	0.769	0.054	0.839	0.931	0.432	0.060	0.374
KA	0.450	0.657	0.033	0.648	0.394	0.857	0.055	0.398
MA	0.193	0.282	0.043	0.132	0.060	-0.044	0.926	0.177
SIS	0.419	0.561	0.046	0.434	0.327	0.337	0.156	0.794

Table 5. Model fit summary

Constructs	R-square	R-square adjusted	Q ² predict	RMSE	MAE
DFI	0.467	0.466	0.488	0.720	0.577
DFL	0.927	0.926	0.925	0.275	0.222
FWB	0.822	0.821	0.756	0.497	0.388
Model Fit Summary	Saturated model	Estimated model			
SRMR	0.093	0.108			
d_uls	7.072	9.626			
d_g	3.874	4.070			
Chi-square	7287.511	7536.918			
NFI	0.658	0.647			

old of 0.90, it remains acceptable in exploratory research, particularly in complex models (Hair et al., 2021). The d_uls and d_g values for the saturated and estimated models are within reasonable ranges, suggesting no severe model misspecification. Collectively, these indices confirm that the structural model demonstrates adequate explanatory power, predictive accuracy, and overall goodness of fit.

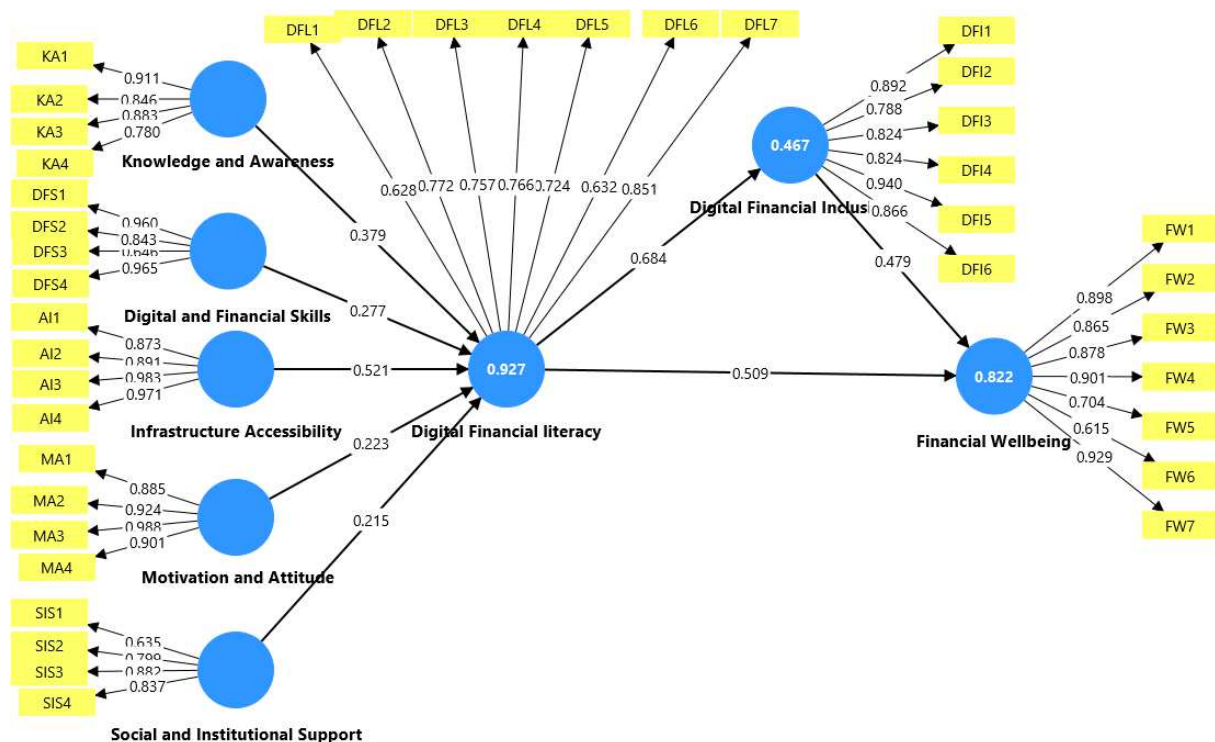
Table 6 summarizes the hypotheses testing results, and Figure 2 illustrates the structural model. The structural model and hypotheses testing results demonstrate that all hypothesized relationships are statistically significant, with path coefficients (β) ranging from 0.215 to 0.684 and p-values below 0.001. Specifically, IA ($\beta = 0.521$, $t = 25.411$, $p < 0.001$) emerged as the strongest predictor of DFL, followed by KA ($\beta = 0.379$, $t = 19.223$, $p < 0.001$) and DFS ($\beta = 0.277$, $t = 17.034$, $p < 0.001$). MA ($\beta = 0.223$, $t = 12.688$, $p < 0.001$) and SIS ($\beta = 0.215$, $t = 12.623$, $p < 0.001$) also significantly influence DFL, underscoring the multidimensional nature of digital capability development. Further, the mediation analysis results demonstrate significant relationships among DFL, DFI, and FWB. The direct effect of DFL on FWB is positive and significant ($\beta = 0.509$, $t = 17.750$, $p < 0.001$), indicating that indi-

viduals with higher levels of DFL experience enhanced FWB. Additionally, DFL significantly predicts DFI ($\beta = 0.684$, $t = 27.151$, $p < 0.001$), suggesting that improved DFL promotes greater inclusion in digital financial systems. The path from DFI to FWB is also significant ($\beta = 0.479$, $t = 15.875$, $p < 0.001$), implying that DFI directly contributes to better FWB. Importantly, the indirect effect of DFL on FWB through DFI is significant ($\beta = 0.328$, $t = 13.341$, $p < 0.001$), confirming the mediating role of DFI. All path coefficients exceed the recommended threshold of 0.10 (Cohen, 2013), and t-values are well above the critical value of 1.96 at the 5% significance level (Hair et al., 2021), affirming both statistical and practical significance. These findings indicate partial mediation, where DFI strengthens the relationship between DFL and FWB, aligning with prior studies emphasizing that DFL enhances financial outcomes by fostering inclusion and access to financial resources (Al-Afeef & Alsmadi, 2025).

Table 7 presents the results of the Necessary Condition Analysis (NCA) alongside the PLS-SEM outcomes for the determinants of DFL. The PLS-SEM findings indicate that all structural paths are positive and statistically significant ($p < 0.001$), confirming that KA ($\beta = 0.379$, $p = 0.001$),

Table 6. Structural model assessment

Hypotheses	Path Coefficient (β)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Decision
KA $\rightarrow$ DFL	0.379	0.020	19.223	0.001	Supported
DFS $\rightarrow$ DFL	0.277	0.016	17.034	0.001	Supported
IA $\rightarrow$ DFL	0.521	0.021	25.411	0.001	Supported
MA $\rightarrow$ DFL	0.223	0.018	12.688	0.001	Supported
SIS $\rightarrow$ DFL	0.215	0.017	12.623	0.001	Supported
DFL $\rightarrow$ FWB	0.509	0.029	17.750	0.001	Supported
DFL $\rightarrow$ DFI	0.684	0.025	27.151	0.001	Supported
DFI $\rightarrow$ FWB	0.479	0.030	15.875	0.001	Supported
DFL $\rightarrow$ DFI $\rightarrow$ FWB	0.328	0.025	13.341	0.001	Supported



DFS ($\beta = 0.277$, $p = 0.001$), IA ($\beta = 0.521$, $p = 0.001$), MA ($\beta = 0.223$, $p = 0.001$), and SIS ($\beta = 0.215$, $p = 0.001$) significantly enhance DFL. The NCA results further reveal that each of these factors serves as a necessary condition for achieving higher levels of DFL, as evidenced by meaningful effect sizes (ranging from 0.139 to 0.434) and significant per-

mutation p-values ($p < 0.05$). Specifically, KA ($d = 0.434$, $p = 0.001$) and IA ($d = 0.218$, $p = 0.001$) exhibit relatively stronger necessary effects compared to other predictors, implying that without a minimum threshold of these conditions, high DFL cannot be attained. Collectively, these results confirm that improvements in knowledge, skills, ac-

Table 7. NCA results and interpretation

Path	PLS SEM Results		NCA Results			Conclusion
	Original sample (O)	P values	Original effect size	95%	Permutation p-value	
KA $\rightarrow$ DFL	0.379	0.001	0.434	0.201	0.001	On average, digital financial literacy will increase with increasing digital financial Knowledge and Awareness, and Knowledge and Awareness is a necessary condition for Digital Financial literacy.
DFS $\rightarrow$ DFL	0.277	0.001	0.207	0.144	0.001	On average, digital financial literacy will increase with increasing Digital and Financial Skills, and Digital and Financial Skills is a necessary condition for Digital Financial literacy.
IA $\rightarrow$ DFL	0.521	0.001	0.218	0.111	0.001	On average, digital financial literacy will increase with increasing Infrastructure Accessibility, and Infrastructure Accessibility is the necessary condition for Digital Financial literacy.
MA $\rightarrow$ DFL	0.223	0.001	0.139	0.127	0.017	On average, digital financial literacy will increase with increasing consumer Motivation and Attitude, and Motivation and Attitude is a necessary condition for Digital Financial literacy.
SIS $\rightarrow$ DFL	0.215	0.001	0.197	0.126	0.001	On average, digital financial literacy will increase with increasing Social and Institutional Support, and Social and Institutional Support is the necessary condition for Digital Financial literacy.

cessibility, motivation, and institutional support are both sufficient and necessary for enhancing DFL, emphasizing their strategic importance in digital inclusion initiatives.

The results of the descriptive and ANOVA analyses indicate significant gender-based differences across most constructs related to DFL and FWB (Table 8). Male respondents consistently reported higher mean scores than female respondents across key dimensions such as KA ($M = 3.15$ vs. 2.46), DFS ($M = 3.80$ vs. 3.23), IA ($M = 4.20$ vs. 3.79), SIS ($M = 3.99$ vs. 3.80), DFL ($M = 3.69$ vs. 3.29), DFI ($M = 4.27$ vs. 4.00), and FWB ($M = 4.25$ vs. 3.91). The ANOVA results further confirm these disparities, showing statistically significant differences ($p < .001$) for all variables except MA ($F = 0.066$, $p = .797$) (Table 9). These findings indicate that gender is associated with systematic differences in individuals' access, awareness, and participation in digital financial systems, reflecting persistent gender gaps in digital and financial competencies. It is important to note, however, that the present analysis comprising descriptive means and one-way ANOVA establishes group-level dif-

ferences in construct means across gender rather than constituting a formal moderation test within the SEM framework. A rigorous test of moderation requires the inclusion of gender as an interaction term (i.e., Gender $\times$ DFL and Gender $\times$ DFI) in the structural model, with significance of the interaction path coefficients serving as evidence of moderation. Accordingly, H10 should be interpreted as providing preliminary evidence that gender conditions the levels of DFL, DFI, and FWB, rather than formally demonstrating that gender moderates the DFI–FWB relationship. Future work incorporating multi-group analysis (MGA) or interaction terms in SmartPLS would permit a proper test of this hypotheses. Nonetheless, the observed disparities underscore the practical importance of gender-sensitive strategies to promote DFI and enhance FWB across demographic groups.

The descriptive and ANOVA results reveal significant variations across residential status (rural, semi-urban, and urban), thereby confirming that residential status is associated with mean-level differences in DFL, DFI, and FWB (Table 10). Urban respondents consistently reported higher mean

Table 8. Mean assessment of all factors across gender categories

Constructs	Gender	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
KA	Male	263	3.153	0.618	0.038	3.078	3.228	2.000	4.250
	Female	168	2.455	0.732	0.056	2.344	2.567	1.000	4.000
	Total	431	2.881	0.746	0.036	2.811	2.952	1.000	4.250
DFS	Male	263	3.805	0.793	0.049	3.709	3.901	1.000	4.750
	Female	168	3.240	0.865	0.067	3.108	3.371	1.000	4.750
	Total	431	3.585	0.866	0.042	3.503	3.667	1.000	4.750
IA	Male	263	4.203	0.607	0.037	4.129	4.276	2.750	5.000
	Female	168	3.796	0.942	0.073	3.653	3.940	1.000	5.000
	Total	431	4.044	0.780	0.038	3.970	4.118	1.000	5.000
MA	Male	263	2.876	0.712	0.044	2.790	2.963	1.000	4.000
	Female	168	2.894	0.693	0.053	2.789	3.000	1.000	4.000
	Total	431	2.883	0.703	0.034	2.817	2.950	1.000	4.000
SIS	Male	263	3.996	0.476	0.029	3.938	4.054	2.250	5.000
	Female	168	3.807	0.546	0.042	3.723	3.890	2.250	5.000
	Total	431	3.922	0.512	0.025	3.874	3.971	2.250	5.000
DFL	Male	263	3.697	0.301	0.019	3.660	3.734	3.000	4.570
	Female	168	3.298	0.492	0.038	3.223	3.373	2.000	4.140
	Total	431	3.541	0.433	0.021	3.500	3.582	2.000	4.570
DFI	Male	263	4.273	0.392	0.024	4.225	4.320	3.000	5.000
	Female	168	4.006	0.584	0.045	3.917	4.095	2.000	5.000
	Total	431	4.169	0.493	0.024	4.122	4.215	2.000	5.000
FWB	Male	263	4.252	0.376	0.023	4.206	4.298	3.140	5.000
	Female	168	3.911	0.631	0.049	3.815	4.007	1.860	5.000
	Total	431	4.119	0.518	0.025	4.070	4.168	1.860	5.000

Table 9. One-way ANOVA assessment of all factors across gender categories

	Constructs	Sum of Squares	df	Mean Square	F	Sig.
KA	Between Groups	49.901	1	49.901	113.002	0.001
	Within Groups	189.443	429	0.442		
	Total	239.343	430			
DFS	Between Groups	32.789	1	32.789	48.527	0.001
	Within Groups	289.870	429	0.676		
	Total	322.659	430			
IA	Between Groups	16.927	1	16.927	29.686	0.001
	Within Groups	244.611	429	0.570		
	Total	261.537	430			
MA	Between Groups	0.033	1	0.033	0.066	0.797
	Within Groups	212.765	429	0.496		
	Total	212.798	430			
SIS	Between Groups	3.687	1	3.687	14.501	0.001
	Within Groups	109.084	429	0.254		
	Total	112.771	430			
DFL	Between Groups	16.344	1	16.344	109.382	0.001
	Within Groups	64.101	429	0.149		
	Total	80.445	430			
DFI	Between Groups	7.283	1	7.283	32.150	0.001
	Within Groups	97.187	429	0.227		
	Total	104.471	430			
FWB	Between Groups	11.943	1	11.943	49.511	0.001
	Within Groups	103.485	429	0.241		
	Total	115.428	430			

scores in KA ($M = 3.06$), DFS ($M = 3.74$), IA ($M = 4.22$), SIS ($M = 4.01$), DFL ($M = 3.68$), DFI ($M = 4.27$), and FWB ($M = 4.26$) compared to their rural counterparts. The ANOVA results further confirm statistically significant differences ($p < .001$) across groups for all variables except MA ($p = .100$), indicating that residential context sub-

stantially influences individuals' access to and utilization of digital financial services (Table 11). These disparities suggest that the impact of DFL on FWB may vary by residential status, as urban residents benefit from superior infrastructure, institutional support, and exposure to digital ecosystems, whereas rural populations face structural

Table 10. Mean assessment of all factors across residential status

	Constructs	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
KA	Rural	115	2.498	0.681	0.064	2.372	2.624	1.000	4.00
	Semi Urban	90	2.911	0.736	0.078	2.757	3.065	1.000	4.00
	Urban	226	3.064	0.711	0.047	2.971	3.157	1.000	4.25
	Total	431	2.881	0.746	0.036	2.811	2.952	1.000	4.25
DFS	Rural	115	3.100	0.858	0.080	2.942	3.259	1.000	4.50
	Semi Urban	90	3.792	0.748	0.079	3.635	3.948	2.000	4.75
	Urban	226	3.749	0.822	0.055	3.641	3.857	2.000	4.75
	Total	431	3.585	0.866	0.042	3.503	3.667	1.000	4.75
IA	Rural	115	3.765	0.897	0.084	3.600	3.931	1.000	5.00
	Semi Urban	90	3.953	0.763	0.080	3.793	4.113	2.000	5.00
	Urban	226	4.222	0.670	0.045	4.135	4.310	2.000	5.00
	Total	431	4.044	0.780	0.038	3.970	4.118	1.000	5.00
MA	Rural	115	2.770	0.744	0.069	2.632	2.907	1.000	4.00
	Semi Urban	90	2.881	0.585	0.062	2.758	3.003	1.750	4.00
	Urban	226	2.943	0.721	0.048	2.848	3.037	1.000	4.00
	Total	431	2.883	0.703	0.034	2.817	2.950	1.000	4.00

Table 10 (cont.). Mean assessment of all factors across residential status

	Constructs	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
SIS	Rural	115	3.780	0.494	0.046	3.689	3.872	2.500	5.00
	Semi Urban	90	3.881	0.562	0.059	3.763	3.998	2.250	5.00
	Urban	226	4.011	0.483	0.032	3.948	4.074	2.250	5.00
	Total	431	3.922	0.512	0.025	3.874	3.971	2.250	5.00
DFL	Rural	115	3.258	0.445	0.042	3.176	3.341	2.000	4.00
	Semi Urban	90	3.543	0.378	0.040	3.464	3.622	2.430	4.14
	Urban	226	3.685	0.373	0.025	3.636	3.734	2.140	4.57
	Total	431	3.541	0.433	0.021	3.500	3.582	2.000	4.57
DFI	Rural	115	3.952	0.526	0.049	3.855	4.049	2.000	5.00
	Semi Urban	90	4.167	0.451	0.048	4.072	4.261	3.000	5.00
	Urban	226	4.280	0.456	0.030	4.220	4.339	3.000	5.00
	Total	431	4.169	0.493	0.024	4.122	4.215	2.000	5.00
FWB	Rural	115	3.825	0.550	0.051	3.723	3.927	1.860	4.86
	Semi Urban	90	4.124	0.448	0.047	4.030	4.218	3.000	5.00
	Urban	226	4.267	0.463	0.031	4.206	4.327	3.000	5.00
	Total	431	4.119	0.518	0.025	4.070	4.168	1.860	5.00

and informational constraints. It should be noted, however, that the analyses reported descriptive means (Table 10) and one-way ANOVA (Table 11) tests for mean-level differences in constructs across residential groups, not for moderation in the statistical sense. Demonstrating that residential status moderates the DFL–DFI–FWB relation-

ships requires estimating interaction effects (e.g., Residential Status $\times$ DFL on FWB) within the SEM or conducting multi-group analysis (MGA) that compares path coefficients across rural, semi-urban, and urban subsamples and tests the significance of inter-group differences. Accordingly, H11 should be reinterpreted as evidence that residen-

Table 11. One-way ANOVA assessment of all factors across residential status

	Constructs	Sum of Squares	df	Mean Square	F	Sig.
KA	Between Groups	24.548	2	12.274	24.457	0.001
	Within Groups	214.796	428	0.502		
	Total	239.343	430			
DFS	Between Groups	36.965	2	18.483	27.689	0.001
	Within Groups	285.693	428	0.668		
	Total	322.659	430			
IA	Between Groups	16.875	2	8.438	14.760	0.001
	Within Groups	244.662	428	0.572		
	Total	261.537	430			
MA	Between Groups	2.280	2	1.140	2.317	0.100
	Within Groups	210.518	428	0.492		
	Total	212.798	430			
SIS	Between Groups	4.252	2	2.126	8.385	0.001
	Within Groups	108.519	428	0.254		
	Total	112.771	430			
DFL	Between Groups	13.844	2	6.922	44.484	0.001
	Within Groups	66.600	428	0.156		
	Total	80.445	430			
DFI	Between Groups	8.166	2	4.083	18.147	0.001
	Within Groups	96.304	428	0.225		
	Total	104.471	430			
FWB	Between Groups	14.886	2	7.443	31.685	0.001
	Within Groups	100.542	428	0.235		
	Total	115.428	430			

tial context is associated with differential levels of DFL, DFI, and FWB, providing a substantive rationale for further moderation testing rather than constituting a formal moderation test. Future studies should conduct MGA or latent moderated SEM to rigorously examine whether and how residential status conditions the structural relationships between DFL, DFI, and FWB.

4. DISCUSSION

The findings confirm that DFL operates as a central mediating capability within India's digital financial ecosystem, shaped by multiple antecedents and transmitting its effects on FWB both directly and through DFI. Several patterns in the data warrant interpretive attention beyond simply restating the coefficients.

Infrastructure accessibility emerged as the strongest predictor of DFL ($\beta = 0.521$), which is particularly notable given that Delhi-NCR is a metropolitan region generally assumed to have relatively advanced digital connectivity. This finding suggests that within-urban heterogeneity in internet access and device ownership creates persistent literacy gaps even in high-density economic corridors. Digital infrastructure directly determines an individual's capacity to develop digital financial competencies (Andaregie et al., 2024; Shatila et al., 2025), and the NCA result confirms it as a necessary condition for literacy development (Nguyen, 2022), not merely a significant predictor. This contrasts with evidence from more mature digital economies reviewed by Lyons and Kass-Hanna (2021), where motivational and skill barriers dominate once basic connectivity is established, suggesting that the appropriate sequencing of intervention differs across development contexts (Demirgüç-Kunt et al., 2022; Wang et al., 2025). Knowledge and awareness ($\beta = 0.379$) and digital and financial skills ($\beta = 0.277$) are the next strongest antecedents. Individuals who understand digital financial products are better positioned to evaluate alternatives and make informed decisions (Goyal & Kumar, 2021; Yang et al., 2023), while operational skill translates that knowledge into effective platform usage (Seldal & Nyhus, 2022; Kumar et al., 2023). Motivation and attitude (MA, $\beta = 0.223$) and social and institutional sup-

port (SIS, $\beta = 0.215$) contribute more modestly. One plausible explanation is that the compulsory shift to digital payments during the COVID-19 pandemic normalized digital financial behavior in urban Delhi-NCR, partially reducing attitudinal barriers, consistent with Pandey et al. (2022) and Chhillar et al. (2025), who argue attitudinal barriers are most consequential where digital finance remains unfamiliar. However, NCA findings confirm that motivational readiness and institutional support remain necessary conditions for DFL (Jeilani et al., 2025), and their weaker effect in this sample should not be generalized to rural contexts where these barriers are more binding (Appiah & Agblewornu, 2025; Silinskas et al., 2023).

The strongest structural path is DFL $\rightarrow$ DFI ($\beta = 0.684$), substantially exceeding the DFL $\rightarrow$ FWB direct path ($\beta = 0.509$), indicating that literacy manifests most immediately in greater digital financial participation rather than directly in welfare improvement. This is consistent with Kamble et al. (2024) and Choung et al. (2023), who identify inclusion as the primary transmission mechanism through which literacy generates welfare gains, and with Kamboj and Sharma (2025), who show that DFI facilitates access to the financial services through which literacy-driven competencies are monetized. The DFI $\rightarrow$ FWB path ($\beta = 0.479$) confirms that the active use of digital financial services reduces transaction costs, expands credit accessibility, and facilitates savings and investment, consistent with Carè et al. (2025) and Kadir et al. (2025). However, the dominance of the DFL $\rightarrow$ DFI path implies a potential vulnerability: if inclusion-enabling conditions deteriorate through platform disruptions, rising data costs, or cybersecurity incidents, the welfare benefits of literacy investments could be substantially attenuated (Afzal et al., 2025; Shaikh et al., 2023). The partial mediation of DFI (H9, $\beta = 0.328$) confirms that DFL also generates welfare gains through cognitive channels, improved financial planning, risk awareness, and decision quality, independently of active platform usage (Grohmann et al., 2018; Al-Afeef & Alsmadi, 2025; Kaur et al., 2021). This direct path is more prominent than in comparable Southeast Asian studies (Tze-Lin et al., 2025), possibly reflecting Delhi-NCR's more financially planning-oriented urban consumer base.

The gender and residential analyses reveal that male respondents consistently outperform female respondents across DFL, DFI, and FWB, and urban respondents outperform rural counterparts. These patterns are consistent with Mishra et al. (2024) and Gammage et al. (2017), who documented that gender disparities in DFI persist through structural and sociocultural barriers rather than motivational differences per se, a finding reinforced by the absence of a significant gender difference in MA ($F = 0.066$, $p = .797$). Wu & Zhang (2025) and Rahayu et al. (2023) similarly show that residential context shapes DFI outcomes and that structural barriers disproportionately constrain rural women's financial empowerment. The convergence of motivational orientation across genders, despite persistent structural gaps, suggests that attitudinal barriers may be receding in urban India, while capability and access barriers endure a distinction with direct implications for intervention design (Kulkarni & Ghosh, 2021; Hasan et al., 2023). Importantly, these analyses establish group-level mean differences rather than formally demonstrating moderation of structural paths; a rigorous test via multi-group analysis (MGA) in SmartPLS remains a priority for future research.

Several methodological considerations bound these interpretations. The cross-sectional design precludes causal inference: reverse causation, whereby higher FWB enables investment

in digital competencies, cannot be ruled out, particularly given that income strongly predicts both digital access and financial literacy in India (Lenka & Barik, 2018). Self-reported measurement of DFL and DFI may inflate scores through social desirability bias, especially in the upwardly mobile Delhi-NCR demographic. Finally, the metropolitan sampling frame limits generalizability: rural and semi-urban contexts, where structural barriers are more severe, may exhibit substantially different structural relationships (Koomson et al., 2020; Mwakalila & Muba, 2025), and future longitudinal multi-region studies are needed to assess the generalizability of these pathways.

Overall, this study contributes an integrated, empirically validated model of digital financial capability in an emerging economy, extending Kamble et al. (2024) and Bhat et al. (2024) by simultaneously testing multidimensional antecedents, mediation, and demographic heterogeneity within a unified PLS-SEM framework. Policymakers designing interventions under Pradhan Mantri Jan Dhan Yojana or the Digital India initiative should note that connectivity infrastructure is the precondition determining the return on literacy investment, that gender-sensitive program design remains critical even in metropolitan areas, and that inclusion without foundational literacy is insufficient to generate sustainable welfare gains.

CONCLUSION AND LIMITATIONS

The purpose of this study was to examine the determinants of DFL and to explore how DFL is associated with DFI and FWB, while assessing the extent to which gender and residential status condition these relationships. The cross-sectional findings provide evidence that IA, KA, DFS, MA, and SIS are each positively associated with DFL. Higher DFL was, in turn, positively associated with DFI and, through it, with FWB. Furthermore, DFI partially mediated the relationship between DFL and FWB, suggesting that both digital literacy and active financial inclusion may contribute to positive financial outcomes, although the cross-sectional design precludes the causal interpretation of these associations. The findings also indicate that male respondents and urban residents tended to report higher levels of DFL, DFI, and FWB, highlighting that demographic and residential context should be considered when designing digital financial initiatives. In general, the results are consistent with the view that an inclusive approach to digital financial ecosystems encompassing knowledge, skills, infrastructure, motivation, and social support is associated with improved financial well-being, though longitudinal research is needed to confirm the directionality of these relationships.

The study, though positive, has some limitations. Firstly, the cross-sectional character limits the inferences on causal relationships among the constructs. Second, the use of self-reported instruments could have resulted in response bias and over-reporting of digital and FWB. Third, the sample is limited to

Indian households, so it is impossible to generalize the results to other cultures or countries. Also, although gender and residential status were examined as demographic conditioning variables through descriptive and ANOVA comparisons, other possible relevant demographic and socioeconomic variables, e.g., age, income, and education, were not analyzed. Lastly, rapid advances in digital financial services technology could also impact the potential relevance of the findings in the future, necessitating continuous evaluation of literacy and inclusion trends.

The limitations can be overcome by future studies implementing longitudinal designs to optimally capture correlations between causes and effects and the temporal variation in DFL and DFI. Generalizability would be improved and comparative information obtained by broadening the study to encompass various geographical and cultural backgrounds. Different moderating and mediating variables could also be included in future studies to gain better insights into the outcomes of FWB, including income, education, technology preparedness, and behavioral aspects. Furthermore, it might be interesting to discuss the value of emerging technologies in finance that can enhance the effectiveness and inclusiveness of financial literacy programs like mobile banking apps, digital wallets, or FinTech innovations. Research based on policy considerations concerning a gender-sensitive and rural-based initiative would assist in bridging the digital and financial gap, where accessible digital financial services equally impact all groups of people. This paper aims to fill this gap by providing information that can guide policymakers to improve DFL and facilitate equitable DFI and FWB across different demographic cohorts.

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REFERENCES

1. Afjal, M. (2023). Bridging the financial divide: a bibliometric analysis on the role of digital financial services within FinTech in enhancing financial inclusion and economic development. *Humanities and Social Sciences Communications*, 10(1), 1-27. <https://doi.org/10.1057/s41599-023-02086-y>
2. Afzal, M., Meraj, M., Kaur, M., & Shamim Ansari, M. (2025). How does cybersecurity awareness help in achieving digital financial inclusion in rural India under escalating cyber fraud scenario? *Journal of Cyber Security Technology*, 9(2), 88-126. <https://doi.org/10.1080/23742917.2024.2347674>
3. Al-Afeef, M. A., & Alsmadi, A. A. (2025). Digital empowerment: unraveling the impact of digital literacy on financial mastery. *Discover Sustainability*, 6(1), 311. <https://doi.org/10.1007/s43621-025-01137-5>
4. Andaregie, A., Abebe, G. K., Gupta, P., Worku, G., Matsumoto, H., Astatkie, T., & Takagi, I. (2024). Exploring individuals' socioeconomic characteristics and digital infrastructure determinants of digital payment adoption in Ethiopia. *Digital Business*, 4(2), 100092. <https://doi.org/10.1016/j.digbus.2024.100092>
5. Appiah, T., & Agblewornu, V. V. (2025). The interplay of perceived benefit, perceived risk, and trust in Fintech adoption: Insights from Sub-Saharan Africa. *Heliyon*, 11(2). <https://doi.org/10.1016/j.heliyon.2025.e41992>
6. Asif, M., & Sarwar, F. (2025). Impact of customer relationship management, financial literacy

- and social influence on online banking adoption: The moderating role of personal innovativeness. *Asia-Pacific Journal of Business Administration*, 17(3), 744-764. <https://doi.org/10.1108/apjba-04-2024-0232>
7. Bhat, S. A., Lone, U. M., SivaKumar, A., & Krishna, U. G. (2024). Digital financial literacy and financial well-being – evidence from India. *International Journal of Bank Marketing*, 43(3), 522-548. <https://doi.org/10.1108/ijbm-05-2024-0320>
 8. Carè, R., Boitan, I. A., Stoian, A. M., & Fatima, R. (2025). Exploring the landscape of financial inclusion through the lens of financial technologies: A review. *Finance Research Letters*, 72, 106500. <https://doi.org/10.1016/j.frl.2024.106500>
 9. Chaurasia, S. S., Verma, S., & Singh, V. (2019). Exploring the intention to use M-payment in India: Role of extrinsic motivation, intrinsic motivation and perceived demonetization regulation. *Transforming Government: People, Process and Policy*, 13(3/4), 276-305. <https://doi.org/10.1108/tg-09-2018-0060>
 10. Chhillar, N., Sharma, K., & Arora, S. (2025). Exploring the role of digital financial literacy and personal financial behavior in shaping financial stress and well-being in the digital age. *Acta Psychologica*, 259, 105308. <https://doi.org/10.1016/j.actpsy.2025.105308>
 11. Choung, Y., Chatterjee, S., & Pak, T. Y. (2023). Digital financial literacy and financial well-being. *Finance Research Letters*, 58, 104438. <https://doi.org/10.1016/j.frl.2023.104438>
 12. Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Routledge. <https://doi.org/10.4324/9780203771587>
 13. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. <https://doi.org/10.2307/249008>
 14. Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank. <https://doi.org/10.1596/978-1-4648-1897-4>
 15. Diamantopoulos, A., & Siguaw, J. A. (2006). Formative versus reflective indicators in organizational measure development. *British Journal of Management*, 17(4), 263-282. <https://doi.org/10.1111/j.1467-8551.2006.00500.x>
 16. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177/002224378101800104>
 17. Gammage, S., Kes, A., Winoograd, L., Sultana, N., Hiller, S., & Bourgault, S. (2017). *Gender and digital financial inclusion: What do we know and what do we need to know*. International Center for Research on Women (ICRW).
 18. Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems*, 18(1), 185-214. <https://doi.org/10.1080/07421222.2001.11045669>
 19. Goyal, K., & Kumar, S. (2021). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, 45(1), 80-105. <https://doi.org/10.1111/ijcs.12605>
 20. Grohmann, A., Klühs, T., & Menkhoff, L. (2018). Does financial literacy improve financial inclusion? Cross country evidence. *World Development*, 111, 84-96. <https://doi.org/10.1016/j.worlddev.2018.06.020>
 21. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage.
 22. Hasan, R., Ashfaq, M., Parveen, T., & Gunardi, A. (2023). Financial inclusion—does digital financial literacy matter for women entrepreneurs? *International Journal of Social Economics*, 50(8), 1085-1104. <https://doi.org/10.1108/IJSE-04-2022-0277>
 23. Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems*, 116(1), 2-20. <https://doi.org/10.1108/IMDS-09-2015-0382>
 24. Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing science*, 43(1), 115-135. <https://doi.org/10.1007/s11747-014-0403-8>
 25. Ho, T. L., & Ho, T. H. (2025). Digital inclusion or exclusion? Exploring the moderating role of governance in digitalization's impact on income inequality in developing countries. *Research in Globalization*, 10, 100283. <https://doi.org/10.1016/j.res-glo.2025.100283>
 26. Jeilani, A., Ahmed, S. A., & Arabow, A. (2025). Understanding e-government adoption among government employees: The mediating role of perceived attitude across key predictors. *Discover Sustainability*, 6(1). <https://doi.org/10.1007/s43621-025-01592-0>
 27. Kadir, R. D., Tri Wahyudi, S., Mas-ki, G., & Devia Sagita Sumantri, V. (2025). The role of financial inclusion in reducing household poverty: Insights from eastern Indonesia. *Cogent Economics & Finance*, 13(1). <https://doi.org/10.1080/23322039.2025.2588925>
 28. Kamble, P. A., Mehta, A., & Rani, N. (2024). Financial inclusion and digital financial literacy: Do they matter for financial well-being? *Social Indicators Research*, 171(3), 1125-1147. <https://doi.org/10.1007/s11205-023-03264-w>
 29. Kamboj, V., & Sharma, D. (2025). Mapping the landscape of digital financial inclusion and proposing integrative framework: trends, influential works, and future directions. *Humanities and Social Sciences Communications*, 12(1), 1-19. <https://doi.org/10.1057/s41599-025-05500-9>

30. Kanungo, E. (2025). Determinants of digital financial literacy and its impact on digital financial inclusion in Odisha, India – a study on the mediating role of digital operations. *Journal of Science and Technology Policy Management*, 1-20. <https://doi.org/10.1108/jstpm-04-2024-0135>
31. Kaur, G., Singh, M., & Singh, S. (2021). Mapping the literature on financial well-being: A systematic literature review and bibliometric analysis. *International Social Science Journal*, 71(241-242), 217-241. <https://doi.org/10.1111/issj.12278>
32. Koomson, I., Villano, R. A., & Hadley, D. (2020). Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multidimensional measure of financial inclusion. *Social Indicators Research*, 149(2), 613-639. <https://doi.org/10.1007/s11205-019-02263-0>
33. Koskelainen, T., Kalmi, P., Scornavacca, E., & Vartiainen, T. (2023). Financial literacy in the digital age – A research agenda. *Journal of Consumer Affairs*, 57(1), 507-528. <https://doi.org/10.1111/joca.12510>
34. Kulkarni, L., & Ghosh, A. (2021). Gender disparity in the digitalization of financial services: challenges and promises for women's financial inclusion in India. *Gender, Technology and Development*, 25(2), 233-250. <https://doi.org/10.1080/09718524.2021.1911022>
35. Kumar, P., Pillai, R., Kumar, N., & Tabash, M. I. (2023). The interplay of skills, digital financial literacy, capability, and autonomy in financial decision making and well-being. *Borsa Istanbul Review*, 23(1), 169-183. <https://doi.org/10.1016/j.bir.2022.09.012>
36. Kyeyune, G. N., & Ntayi, J. M. (2025). Empowering rural communities: the role of financial literacy and management in sustainable development. *Frontiers in Human Dynamics*, 6, 1424126. <https://doi.org/10.3389/fhumd.2024.1424126>
37. Lenka, S. K., & Barik, R. (2018). Has expansion of mobile phone and internet use spurred financial inclusion in the SAARC countries? *Financial Innovation*, 4(1), 1-19. <https://doi.org/10.1186/s40854-018-0089-x>
38. Lyons, A. C., & Kass-Hanna, J. (2021). A methodological overview to defining and measuring “digital” financial literacy. *Financial Planning Review*, 4(2), e1113. <https://doi.org/10.1002/cfp2.1113>
39. Marconi, D., Marinucci, M., & Paladino, G. (2025). Digital and financial skills in shaping financial decisions: Exploring the gender gap. *Italian Economic Journal*, 11(2), 571-605. <https://doi.org/10.1007/s40797-024-00298-y>
40. Mishra, D., Agarwal, N., Sharahiley, S., & Kandpal, V. (2024). Digital financial literacy and its impact on financial decision-making of women: Evidence from India. *Journal of Risk and Financial Management*, 17(10), 468. <https://doi.org/10.3390/jrfm17100468>
41. Mwakalila, E., & Muba, S. (2025). The Role of Financial Inclusion in Reducing Income Inequality and Poverty in Africa: A Macro-Level Analysis. *Scientific African*, e02811. <https://doi.org/10.1016/j.sciaf.2025.e02811>
42. Nguyen, A. (2022). Digital inclusion. In P. Liamput-tong (Ed.), *Handbook of social inclusion*. Springer. https://doi.org/10.1007/978-3-030-89594-5_14
43. Pandey, A., Kiran, R., & Sharma, R. K. (2022). Investigating the impact of financial inclusion drivers, financial literacy and financial initiatives in fostering sustainable growth in North India. *Sustainability*, 14(17), 11061. <https://doi.org/10.3390/su141711061>
44. Rahayu, R., Juita, V., & Rahman, A. (2023). Financial literacy, digital financial literacy and women's economic empowerment: Study in West Sumatera, Indonesia. *Journal of Telecommunications and the Digital Economy*, 11(2), 118-138. <https://doi.org/10.18080/jtde.v11n2.700>
45. Rastogi, T., Agarwal, B., & Gopal, G. (2024). Exploring the nexus between sustainable marketing and customer loyalty with the mediating role of brand image. *Journal of Cleaner Production*, 440, 140808. <https://doi.org/10.1016/j.jclepro.2024.140808>
46. Seldal, M. M., & Nyhus, E. K. (2022). Financial vulnerability, financial literacy, and the use of digital payment technologies. *Journal of Consumer Policy*, 45(2), 281-306. <https://doi.org/10.1007/s10603-022-09512-9>
47. Shaikh, A. A., Alamoudi, H., Alharthi, M., & Glavee-Geo, R. (2023). Advances in mobile financial services: a review of the literature and future research directions. *International Journal of Bank Marketing*, 41(1), 1-33. <https://doi.org/10.1108/ijbm-06-2021-0230>
48. Shatila, K., Aránega, A. Y., Soga, L. R., & Hernández-Lara, A. B. (2025). Digital literacy, digital accessibility, human capital, and entrepreneurial resilience: a case for dynamic business ecosystems. *Journal of Innovation & Knowledge*, 10(3), 100709. <https://doi.org/10.1016/j.jik.2025.100709>
49. Shmueli, G., Ray, S., Estrada, J. M. V., & Chatla, S. B. (2016). The elephant in the room: Predictive performance of PLS models. *Journal of Business Research*, 69(10), 4552-4564. <https://doi.org/10.1016/j.jbusres.2016.03.049>
50. Silinskas, G., Ahonen, A. K., & Wilska, T. A. (2023). School and family environments promote adolescents' financial confidence: Indirect paths to financial literacy skills in Finnish PISA 2018. *Journal of Consumer Affairs*, 57(1), 593-618. <https://doi.org/10.1111/joca.12513>
51. Tay, L. Y., Tai, H. T., & Tan, G. S. (2022). Digital financial inclusion: A gateway to sustainable development. *Heliyon*, 8(6). <https://doi.org/10.1016/j.heliyon.2022.e09766>
52. Tulcanaza-Prieto, A. B., Cortez-Ordoñez, A., Rivera, J., & Lee, C. W. (2025). Is digital literacy a moderator variable in the relationship between financial literacy, financial inclusion, and financial well-being in the Ecuadorian context? *Sustainability*, 17(6), 2476. <https://doi.org/10.3390/su17062476>

53. Tze-Lin, T., Lu, M. P., & Kosim, Z. (2025). The mediating effect of digital financial inclusion on gender differences in digital financial literacy and financial well-being: Evidence from Malaysian households. *Investment Management & Financial Innovations*, 22(1), 11. [https://doi.org/10.21511/imfi.22\(1\).2025.02](https://doi.org/10.21511/imfi.22(1).2025.02)
54. Uthaileang, W., & Kiattisin, S. (2023). Developing the capability of digital financial literacy in developing countries: A case of on-line loan for small entrepreneurs. *Heliyon*, 9(12), e21961. <https://doi.org/10.1016/j.heliyon.2023.e21961>
55. Wang, X., Ding, Y., Dong, Q., Sun, S., & Chen, Z. (2025). Impact of digital divide on household consumption: role of mental health and happiness. *International Review of Economics & Finance*, 99, 104027. <https://doi.org/10.1016/j.iref.2025.104027>
56. Wu, Y., & Zhang, J. (2025). Digital inclusive finance and rural households' economic resilience. *Finance Research Letters*, 74, 106706. <https://doi.org/10.1016/j.frl.2024.106706>
57. Yang, J., Wu, Y., & Huang, B. (2023). Digital finance and financial literacy: Evidence from Chinese households. *Journal of Banking & Finance*, 156, 107005. <https://doi.org/10.1016/j.jbankfin.2023.107005>

APPENDIX A

Table A1. Questionnaire items

Constructs	Coding	Measurement items
Knowledge and Awareness	KA1	I am aware of the availability of digital financial services (e.g., mobile banking, e-wallets).
	KA2	I understand the benefits of using digital financial platforms.
	KA3	I keep myself updated about new trends in digital finance (e.g., UPI, QR code payments).
	KA4	I am aware of potential risks (e.g., fraud, cyber threats) in digital financial transactions.
Digital and Financial Skills	DFS1	I have the digital skills necessary to use mobile banking or payment apps effectively.
	DFS2	I am confident in completing financial transactions online without assistance.
	DFS3	I can easily compare different digital financial products and services.
	DFS4	I understand how to manage budgets, savings, and expenses using digital tools.
Infrastructure Accessibility	IA1	I have reliable access to the internet for digital financial activities.
	IA2	I own and use a smartphone that supports financial applications.
	IA3	I find digital financial platforms affordable and cost-effective.
	IA4	The design of digital financial apps is user-friendly for me.
Motivation and Attitude	MA1	I prefer digital financial services over traditional cash-based transactions.
	MA2	I believe using digital finance improves my financial decision-making.
	MA3	I feel more empowered when managing money through digital platforms.
	MA4	I am motivated to improve my digital financial skills.
Social and Institutional Support	SIS1	I receive guidance from family or peers about using digital financial services.
	SIS2	My bank/financial institution provides adequate support for digital transactions.
	SIS3	Government initiatives (e.g., awareness campaigns, training) encourage me to adopt digital finance.
	SIS4	I trust recommendations from social networks (friends, colleagues) regarding digital financial services.
Digital Financial literacy	DFL1	I never share my bank account password, PIN, or other confidential information with anyone.
	DFL2	I check the security of a website (e.g., HTTPS, safety logo, certificates) before making online transactions.
	DFL3	I can use digital devices and internet-based tools to access, monitor, and manage my financial accounts and transactions.
	DFL4	I am confident in using mobile/online banking or e-wallets to initiate and complete financial transactions.
	DFL5	I know how to correct, reverse, or cancel a digital financial transaction when needed.
	DFL6	I have experience in transferring money, checking account balances, and other financial services through mobile/online banking or e-wallets.
	DFL7	I understand the benefits of using digital financial services such as mobile banking, Internet banking, and e-wallets.
Digital Financial Inclusion	DFI1	I can borrow money from the Internet/ mobile banking/e-wallet.
	DFI2	I can make a payment by using Internet/mobile banking/e-wallet.
	DFI3	I can buy an insurance plan through the internet/mobile banking/e-wallet.
	DFI4	I can make investments with Internet/mobile banking/e-wallet.
	DFI5	I use Internet/mobile banking/e-wallet at least once a month.
	DFI6	I use Internet/mobile banking/e-wallet to save money or build an emergency fund.
Financial Wellbeing	FWB1	Digital financial services have improved my ability to save and manage expenses effectively.
	FWB2	Access to digital financial services has reduced my dependence on cash transactions.
	FWB3	Digital financial services have reduced my financial stress by making money management more convenient and accessible.
	FWB4	Digital financial services have enabled me to save more consistently and work towards my long-term financial goals.
	FWB5	Using digital financial services has enhanced my overall financial security and confidence.
	FWB6	I believe digital financial services have contributed positively to my economic well-being.
	FWB7	Digital financial services have increased my confidence to manage and grow my personal finances effectively.