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Digital Financial Literacy in Rural Emerging Economies: Exploring Its Multidimensional Factor Structure

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Abstract
The rapid digitalization of financial services in emerging economies has created unprecedented opportunities to foster financial inclusion and socio-economic empowerment. In India, state-led initiatives and technological innovations—such as the Pradhan Mantri Jan-Dhan Yojana (PMJDY), Aadhaar-enabled Payment System (AePS), and Unified Payments Interface (UPI)—have significantly expanded financial access. However, a persistent usage gap exists in rural areas, where technology availability does not automatically yield sustained adoption. Digital Financial Literacy (DFL) serves as a critical enabler bridging this gap. Drawing upon the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) and Perceived Risk Theory, this study empirically investigates the multi-dimensional structure of DFL determinants across rural Gujarat. Utilizing a structured survey administered across all 33 districts (N=1,000), an Exploratory Factor Analysis (EFA) via Principal Component Analysis with Varimax Rotation was conducted. The measurement scale was systematically adapted from validated global literature and customized for the rural Gujarat context. The empirical model extracts 14 distinct latent constructs explaining 65.630% of total variance. The findings highlight that while technical infrastructure and functional knowledge establish baseline adoption, relational factors—including system trust, risk control self-efficacy, and user experience—dictate long-term engagement. The study provides targeted policy recommendations for regulatory bodies, financial institutions, and rural development agencies to accelerate inclusive digital transformation.

Keywords: Digital Financial Literacy, Financial Inclusion, Rural Economy, UTAUT2, Scale Adaptation, Exploratory Factor Analysis, Trust, User Experience, Government Policy

Introduction

Global economic policy increasingly views financial inclusion as a cornerstone of sustainable development. The transition from traditional brick-and-mortar banking to Digital Financial Services (DFS) has reduced transaction costs, enhanced transaction speed, and democratized access for historically unbanked populations. In India, this evolution has been supported by institutional frameworks such as the Jan Dhan-Aadhaar-Mobile (JAM) trinity, National Payments Corporation of India (NPCI) platforms, and Reserve Bank of India (RBI) regulatory sandboxes. Despite these advancements, infrastructural expansion has outpaced end-user capability, giving rise to a pronounced digital financial divide. Rural populations face unique structural constraints. Navigating digital financial ecosystems requires an integrated set of competencies: basic functional financial knowledge, digital interface navigation skills, security awareness, and institutional confidence. This integrated construct is defined as Digital Financial Literacy (DFL). Lacking DFL, rural consumers face heightened vulnerability to cyber fraud, identity theft, unauthorized account access, and severe aversion to formal digital channels.

Gujarat represents an important context for DFL investigation. Characterized by high industrialization and agricultural output, the state exhibits stark disparities between urban digital adoption and rural financial participation. Rural areas across North Gujarat, Central Gujarat, Saurashtra, Kachchh, and South Gujarat encounter uneven telecommunication connectivity, varied literacy rates, and distinct socio-cultural norms. Existing studies predominantly focus on urban areas or examine demographic drivers in isolation. To address these empirical gaps, this research investigates the underlying latent structure driving Digital Financial Literacy (DFL) adoption among rural residents in Gujarat. Grounded in consumer adoption theory, the study seeks to identify the core latent factors constituting DFL among rural populations and examine how infrastructural, cognitive, risk-related, and institutional factors interact to shape DFL adoption in rural settings.

2. Literature Review & Theoretical Framework:

2.1 Theoretical Foundation: Paragraph-Based

Framing of DFL:
To conceptualize DFL adoption, this study synthesizes the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) and Perceived Risk Theory. The core adoption drivers from UTAUT2—specifically facilitating conditions, effort expectancy, performance expectancy, and social influence—explain how technical accessibility and perceived functional benefits motivate initial usage. In the context of rural digital finance, these adoption drivers operate alongside risk and governance constructs, including cybersecurity awareness, transactional risk control, and structural trust. Together, these theoretical perspectives form an integrated paradigm wherein infrastructural enablers and cognitive competencies reduce perceived effort, while institutional safeguards and self-efficacy mitigate perceived transactional risk. This integrated framework directly maps onto the empirical 14-factor structure of Digital Financial Literacy, explaining both the adoption decision and sustained digital financial behavior.

2.2 Functional and Technical Knowledge:
Traditional financial literacy—encompassing budgeting, interest calculation, inflation awareness, and risk diversification—is foundational to sound decision-making. However, digital delivery channels require additional technical competencies. Users must be proficient in operating smart devices, navigating mobile applications, executing internet banking transactions, and understanding specialized payment protocols such as UPI, NEFT, and IMPS.

2.3 Risk Perception, Security, and Trust:
Security and privacy concerns represent primary barriers to digital financial adoption. Rural populations are especially vulnerable to phishing, smishing, and social engineering scams. In low-income communities, indirect experiences with fraud—such as localized community reports—amplify risk aversion and weaken institutional trust. Building trust requires formal consumer protection frameworks, transparent grievance redressal mechanisms, and awareness of legal rights such as the RBI Banking Ombudsman Scheme.

2.4 Facilitating Infrastructure and Product Characteristics:
Facilitating conditions—such as reliable cellular connectivity, electricity grid stability, and local device repair services—form the physical basis of DFL adoption. Furthermore, product characteristics including usability, affordability, design clarity, and alignment with rural income patterns directly affect consumer evaluation. When financial applications offer localized languages and clear user experience flows, adoption barriers decrease significantly.

2.5 Socio-Cultural Influence and Intrinsic Motivation:
Social networks strongly shape economic behaviors in close-knit rural communities. Peer recommendations, family approval, and community perceptions influence individual adoption decisions. Intrinsic motivators, including financial self-determination, personal empowerment, and transactional incentives like cashbacks and promotional rewards, further sustain continuous engagement with digital platforms.

3. Research Methodology:

3.1 Research Design & Sampling Frame Architecture:
This study employs an empirical, quantitative research design. The target population comprised rural residents aged 18 to 60 years residing across Gujarat. Data collection was executed using a multi-stage stratified quota sampling scheme across all 33 administrative districts of the state. To ensure balanced geographic and socio-economic representation, the state was divided into five distinct administrative and agro-climatic regions: North Gujarat, Central Gujarat, Saurashtra, Kachchh, and South Gujarat. Quota allocations across individual districts were calculated proportionately using rural population statistics from the Census of India. Within each designated rural cluster, field researchers selected individual respondents using convenience sampling to ensure practical accessibility across diverse socio-economic backgrounds. The final sampling execution yielded a valid sample size of N=1,000 respondents, achieving a 95% confidence level with a 3.1% margin of error. Primary data were gathered through structured, face-to-face administration of bilingual questionnaires formatted in both Gujarati and English.

3.2 Construct Measurement and Scale Adaptation:
The research instrument was constructed by adopting and adapting validated measurement scales from established empirical literature in financial inclusion, digital technology adoption, and behavioral psychology. To ensure content and contextual validity, each construct underwent contextual adaptation specifically tailored to reflect the socio-economic and technical realities of rural Gujarat. Table 1 outlines the complete scale adaptation and source matrix supporting the measurement model.

Table 1: Scale Adaptation and Source Matrix

Construct	Adopted From	Contextual Adaptation
Digital Financial Literacy	Morgan et al. (2020); Lyons & Kass-Hanna (2021)	Adapted to rural Gujarat context

Financial Knowledge	OECD (2022); Lusardi & Mitchell (2014)	Digital finance emphasis
Digital Skills	Eshet (2012); ITU (2022)	Mobile-based financial transactions
Awareness	OECD (2022); World Bank (2022)	Awareness of DFS platforms
Attitude	Ajzen (1991)	Attitude toward digital finance
Behaviour	OECD (2022)	Actual digital financial practices
Financial Capability	Atkinson & Messy (2012)	Digital financial decision-making
Self-Efficacy	Bandura (1986)	Confidence in DFS usage
Self-Determination	Zycinska & Januszek (2021)	Independent financial decisions
Digital Usage	GSMA (2022)	Frequency of digital service use
Quality	AFI (2016); Ravikumar (2017)	Perceived quality of DFS
Trust & Security	Morgan et al. (2020); World Bank (2022)	Security and privacy perceptions
Social Influence	Venkatesh et al. (2003)	Influence of family and peers
Infrastructure & Access	ITU (2022); Pew Research Center (2022)	Access to devices and internet
Adoption Barriers	Lyons & Kass-Hanna (2021); World Bank (2022)	Obstacles to DFS adoption

3.3 Measurement Instrument, Reliability, and Common Method Bias:

The final survey instrument evaluated 49 observable items grouped into multi-item constructs derived from the adaptation matrix. All items were measured on a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). Instrument pre-testing was conducted via a pilot study (n=50). Cronbach's alpha for the pilot instrument reached 0.81, confirming internal consistency reliability exceeding the standard 0.70 threshold (Hair et al., 2019). To evaluate potential Common Method Bias (CMB) inherent in self-reported survey data, Harman's single-factor test was executed. The first unrotated principal component accounted for 17.970% of the total variance. Because this value is well below the standard 50% threshold, common method variance does not pose a significant threat to the validity of the findings.

3.4 Analytical Procedure & Methodological Justification:

Exploratory Factor Analysis (EFA) via Principal Component Analysis (PCA) with Varimax Rotation was selected as the primary analytical technique for several methodological reasons. First, although individual items were adapted from established global literature (e.g., Lusardi & Mitchell, 2014; Morgan et al., 2020; OECD, 2022), the scale was systematically contextualized to capture the specific socio-cultural, technical, and infrastructural realities of rural populations in Gujarat. Because measurement scales frequently exhibit structural variations when transferred across distinct demographic and geographic settings, EFA was essential to uncover the underlying latent factor structure empirically. Second, given the multi-dimensional nature of Digital Financial Literacy (DFL), EFA served as an effective data reduction technique, condensing 49 observable indicators into 14 coherent latent dimensions explaining 65.630% of total variance without imposing restrictive prior structural assumptions. Sampling adequacy and factorability were statistically confirmed by an excellent Kaiser-Meyer-Olkin (KMO) measure of 0.879 and a highly significant Bartlett's Test of Sphericity ($\chi^2=14,977.628, p<0.001$). Factor retention was governed by Kaiser's criterion ("Eigenvalue"≥1.0) and total variance explained thresholds.

4. Data Analysis & Results:

4.1 Test of Sampling Adequacy and Factorability:

Table 2 summarizes the diagnostic tests for factorability. The KMO measure of sampling adequacy reached 0.879, indicating excellent data suitability for factor extraction. Bartlett's Test of Sphericity yielded an approximate $\chi^2=14,977.628$ ($df=1,176$, $p<0.001$), rejecting the identity matrix null hypothesis and confirming sufficient inter-item correlations.

Table 2: KMO and Bartlett's Test		
Metric	**Statistic**	**Value**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.879
Bartlett's Test of Sphericity	Approx. Chi-Square	14,977.63
	df	1,176
	Sig. (p-value)	0

4.2 Communalities Analysis:

Extraction communalities indicate the proportion of variance in each variable accounted for by the extracted factors. High extraction communalities (>0.70) were demonstrated by items measuring system trust (TR1: 0.880), incentive preferences (SDMKS2: 0.836), educational needs (TR3: 0.828), social value (SDMKS3: 0.815), product affordability (PQ1: 0.785), product choices (PQ3: 0.774), repair service access (IA4: 0.731), and transactional error confidence (DFRC4: 0.728). Moderate communalities (0.50-0.70) were recorded for internet access (IA1: 0.541), email capabilities (DK2: 0.516), net banking knowledge (KDFS2: 0.596), and budgeting behaviors (FK1: 0.642). Government policy perception items displayed lower communalities (GPRS2: 0.489), indicating relatively independent variance.

4.3 Total Variance Explained:

Table 3 details the extraction and rotation eigenvalues. Applying Kaiser's criterion ("Eigenvalue"≥1.0), 14 latent factors were extracted, accounting for a cumulative variance of 65.630%. The first factor initially accounted for 17.970% of unrotated variance. Following Varimax rotation, variance was redistributed across factors (ranging from 5.758% for Factor 1 to 3.362% for Factor 14), producing an interpretable structural configuration.

Table 3: Total Variance Explained									
Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	8.806	17.97	17.97	8.806	17.97	17.97	2.821	5.758	5.758
2	3.247	6.627	24.597	3.247	6.627	24.597	2.655	5.419	11.176
3	2.936	5.991	30.588	2.936	5.991	30.588	2.654	5.416	16.593
4	2.561	5.226	35.815	2.561	5.226	35.815	2.564	5.234	21.826
5	2.35	4.797	40.611	2.35	4.797	40.611	2.405	4.909	26.735
6	2.081	4.247	44.858	2.081	4.247	44.858	2.398	4.895	31.63
7	1.632	3.332	48.19	1.632	3.332	48.19	2.381	4.858	36.488
8	1.518	3.099	51.288	1.518	3.099	51.288	2.38	4.857	41.345
9	1.388	2.833	54.122	1.388	2.833	54.122	2.351	4.799	46.144
10	1.263	2.578	56.7	1.263	2.578	56.7	2.327	4.749	50.894
11	1.16	2.368	59.068	1.16	2.368	59.068	2.023	4.129	55.022
12	1.133	2.312	61.38	1.133	2.312	61.38	1.807	3.687	58.709
13	1.094	2.233	63.613	1.094	2.233	63.613	1.744	3.559	62.268
14	1.001	2.017	65.63	0.988	2.017	65.63	1.647	3.362	65.63

15	0.802	1.637	67.267						
16	0.736	1.503	68.77						
17	0.72	1.47	70.24						
18	0.693	1.415	71.655						
19	0.68	1.388	73.043						
20	0.652	1.331	74.375						
21	0.642	1.31	75.684						
22	0.624	1.273	76.957						
23	0.602	1.228	78.185						
24	0.584	1.191	79.376						
25	0.565	1.154	80.53						
26	0.551	1.125	81.655						
27	0.539	1.101	82.756						
28	0.517	1.056	83.812						
29	0.516	1.053	84.865						
30	0.499	1.018	85.883						
31	0.49	1	86.884						
32	0.469	0.958	87.842						
33	0.46	0.939	88.781						
34	0.447	0.912	89.693						
35	0.43	0.878	90.571						
36	0.419	0.856	91.426						
37	0.407	0.831	92.257						
38	0.405	0.826	93.083						
39	0.378	0.771	93.854						
40	0.375	0.765	94.62						
41	0.364	0.744	95.363						
42	0.355	0.724	96.087						
43	0.341	0.696	96.783						
44	0.327	0.667	97.45						
45	0.312	0.638	98.088						

46	0.303	0.618	98.706						
47	0.284	0.579	99.285						
48	0.218	0.445	99.73						
49	0.132	0.27	100						
Extraction Method: Principal Component Analysis.									

4.4 Factor Structure and Rotated Component Matrix:

Table 4 presents the Rotated Component Matrix (Varimax rotation with Kaiser Normalization, converging in 7 iterations). All items display dominant factor loadings exceeding 0.60 on their primary assigned latent dimensions, confirming convergent construct structure.

Table 4: Rotated Component Matrixa

Factor	Short Name	Items	Component													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
Infrastructure Availability	IA1	The internet speed in my area is sufficient for performing digital financial transactions.		.682												
	IA2	I have regular access to Wi-Fi or data plans that enable digital banking or online payments.		.747												
	IA3	I have consistent electricity in my area to charge digital devices.		.761												
	IA4	I have easy access to shops or facilities that provide support and repair services for digital devices.		.779												
Digital Knowledge	DK1	I can conduct online searches effectively using my digital device(s) (Smartphone/DK/Laptop).							.695							
	DK2	I can send and receive emails without assistance.							.602							

	DK3	I use mobile banking to manage my finances.							.771							
	DK4	I access internet banking for various transactions.							.632							
Financial Knowledge	FK1	I prepare a personal finance budget each month.						.711								
	FK2	I prioritize future savings over immediate spending.						.595								
	FK3	I avoid impulse purchases.						.740								
	FK4	I understand how inflation impacts the real return on bank deposits.						.691								
Knowledge of Digital Financial Services	KDFS1	I am aware of digital payment methods such as PhonePe, GPay, Amazon Pay, and UPI.												.602		
	KDFS2	I am knowledgeable about mobile banking, net banking, NEFT, IMPS, Wi-Fi based card tapping												.697		
	KDFS3	I am familiar with digital lending methods like peer-to-peer lending, app-based lending, and supply chain finance.												.731		
Awareness of Digital Finance Risk	ADFR1	I understand the risks, such as phishing and spyware, associated with digital financial transactions.				.719										
	ADFR2	I know strategies to protect myself against risks like phishing				.770										

		and spyware.														
	ADFR3	I never share my one-time password (OTP) with anyone.				.613										
	ADFR4	I keep my username, password, and PIN confidential.				.738										
Digital Finance Risk Control	DFRC1	I initiate and complete digital financial transactions on my own.	.742													
	DFRC2	I can resolve issues that arise during digital transactions.	.772													
	DFRC3	I prefer digital transactions over conventional (cash) transactions.	.771													
	DFRC4	Using digital financial products regularly has made me more confident in handling errors.	.776													
Knowledge of Customer Rights	KCR1	I know where to report issues if I encounter a digital financial transaction risk.											.740			
	KCR2	I am aware of the Ombudsman Scheme for digital transactions available in India.											.743			
	KCR3	I am aware of the time frame within which my complaint related to digital financial transactions should be resolved by my bank or payment											.770			

		service provider.														
Product Suitability	PS1	I find digital financial products or services that align with my financial needs.			.732											
	PS2	I believe digital financial products facilitate my financial goals.			.744											
	PS3	I am aware of customized digital financial products available in the market.			.777											
	PS4	I compare different digital financial products before choosing the one that best suits my needs.			.785											
Product Quality	PQ1	I believe digital financial products and services are affordable.										.877				
	PQ2	I find that Digital Financial Service Providers (DFSPs) offer transparent information about their services.										.856				
	PQ3	I have a variety of choices among digital financial products and services.										.872				
User Experience	UX1	I find it easy to navigate digital financial platforms (websites/apps).									.768					
	UX2	I receive sufficient customer support when I									.778					

		encounter issues with digital financial services.														
	UX3	I find the design of digital financial services user-friendly.									.743					
	UX4	I feel confident in completing digital financial transactions without external assistance.									.719					
Social Networks & Cultural Attitudes	SNCA1	My friends or family influence my decisions regarding digital financial services.													.801	
	SNCA2	I share my experiences with digital financial services with my peers.													.676	
	SNCA3	There is a stigma associated with using digital financial services in my community.													.716	
Self-Determination to Use Knowledge and Skills	SDMKS1	I feel proud to conduct digital financial transactions independently.					.854									
	SDMKS2	I prefer digital transactions because of the rewards, incentives, and cashback benefits.					.911									
	SDMKS3	I use digital financial services because they are socially valued.					.898									
Trust in Digital Financial Systems	TR1	I trust that my personal information is safe when using digital financial services.								.920						

	TR2	I believe that digital financial services are reliable and secure.								.758						
	TR3	I feel that more education on digital finance would help me use these services better.								.888						
Government Policy, Regulations & Support	GPRS1	I am aware of government initiatives to promote digital financial literacy.														.667
	GPRS2	I believe that government policies facilitate access to digital financial services.														.636
	GPRS3	I have participated in government-sponsored financial literacy programs or workshops.														.770

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 7 iterations.

5. Discussion:

The empirical results demonstrate that Digital Financial Literacy in rural contexts is a complex, multi-dimensional construct. The extraction of 14 distinct factors confirms that technology adoption cannot be understood through functional literacy alone.

5.1 Infrastructural and Cognitive Enablers:

Consistent with UTAUT2 assumptions regarding Facilitating Conditions, Factor 1 (Infrastructure Availability, loadings 0.682-0.779) confirms that baseline physical access—stable power, high-speed connectivity, and hardware repair infrastructure—remains an absolute prerequisite for digital participation in rural Gujarat. Cognitively, Factor 2 (Digital Knowledge) and Factor 4 (Knowledge of DFS) operate as fundamental capabilities. Users must possess general digital literacy alongside product-specific functional knowledge to navigate digital financial environments effectively.

5.2 Risk, Security, and Governance Dynamics:

Factors 5 (Awareness of Digital Finance Risks), 6 (Digital Finance Risk Control), and 7 (Knowledge of Customer Rights) highlight the central role of risk perception in financial technology adoption. In rural environments, where financial safety margins are narrow, exposure to security risks creates significant adoption barriers. High factor loadings on items related to PIN confidentiality (ADFR4: 0.738) and error-handling confidence (DFRC4: 0.776) demonstrate that risk management self-efficacy strongly influences transaction frequency. Furthermore, structural trust (Factor 13, TR1: 0.920) and awareness of regulatory mechanisms like the RBI Ombudsman (Factor 7, KCR2: 0.743) provide essential psychological safety nets.

5.3 Behavioral Motivators and Social Ecosystems:

Factors 11 (Social Networks & Cultural Attitudes) and 12 (Self-Determination to Use Knowledge and Skills) capture socio-cultural and intrinsic drivers. High loadings on incentive preferences (SDMKS2: 0.911) demonstrate that direct utility—such as cashbacks and transaction rewards—acts as a catalyst for trial and early adoption. Peer influence and community attitudes (SNCA1: 0.801) further illustrate that social validation helps overcome initial trust barriers in rural social networks.

6. Policy & Strategic Recommendations

Based on these empirical findings, a multi-

stakeholder framework is proposed to improve digital financial literacy across rural areas.

Government and Telecommunication Regulators: Policymakers and utility providers must prioritize last-mile physical infrastructure. Expanding 4G and 5G cellular coverage, enhancing local grid reliability, and supporting local hardware maintenance hubs address the essential facilitating conditions identified in the factor analysis.

Financial Institutions and Fintech Developers: Service providers should design simplified, vernacular interface layouts. Integrating voice-assisted commands, regional language scripts, and transparent fee structures directly targets key product usability and user experience barriers.

Rural Development Intermediaries and Community Ambassadors: Capacity-building initiatives should leverage established grass-roots networks, such as Bank Sakhis, Self-Help Groups (SHGs), and Common Service Centres (CSCs). Deploying trusted local intermediaries to deliver practical risk-management workshops helps overcome community stigma, build transactional confidence, and demystify formal grievance mechanisms like the RBI Ombudsman Scheme.

7. Limitations and Future Research Directions

While this study establishes a robust, context-sensitive measurement framework, several limitations warrant consideration for future research. First, although quota allocations were derived from official Census parameters across all 33 districts, convenience sampling within rural clusters introduces non-probability selection constraints. Future studies should employ probability-based random sampling to enhance population-level generalizability. Second, this paper focuses on establishing the exploratory latent factor structure of DFL. Future empirical research should apply Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) to evaluate structural path coefficients, directional hypotheses, and explanatory power (R^2) on actual digital transaction frequency. Finally, testing this 14-factor framework across other emerging economies will help assess its broader regional cross-validity.

8. Conclusion:

This study provides an empirical evaluation of the determinants shaping Digital Financial Literacy adoption across rural Gujarat. By extracting a 14-factor structure from a sample of 1,000 rural respondents, the study demonstrates that DFL extends beyond basic technical or financial knowledge. Sustainable digital financial inclusion requires an integrated support ecosystem combining stable physical infrastructure, intuitive platform design, robust risk management capabilities, strong regulatory protections, and positive social reinforcement. Addressing these systemic factors will enable policymakers and financial institutions to bridge the rural-urban digital divide and support inclusive economic development.

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References:

1. ACI Worldwide. (2021). Prime time for real-time: Global payments report 2021. ACI Universal Payments.
2. AFI. (2016). Digital financial services indicators: Guideline note no. 21. Alliance for Financial Inclusion.
3. AFI. (2021). Policy frameworks to support digital financial services. AFI Publications.
4. Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.
5. Atkinson, A., & Messy, F. A. (2012). Measuring financial literacy: Results of the OECD / International Network on Financial Education (INFE) pilot study (OECD Working Papers on Finance, Insurance and Private Pensions, No. 15). OECD Publishing.
6. Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice-Hall.
7. Bauer, R. A. (1960). Consumer behavior as risk taking. In R. S. Hancock (Ed.), Dynamic marketing for a changing world (pp. 389–398). American Marketing Association.
8. Chuen, D. L. K., & Phua, W. (2015). Handbook of digital currency: Bitcoin, innovation, financial instruments, and big data. Academic Press.
9. Duflo, E. (2018). Economics of poverty and participation. MIT Press.
10. Eshet, Y. (2012). Thinking in the digital era: A revised model for digital literacy. Issues in Informing Science and Information Technology, 9, 267–276.
11. Fenwick, M., & Vermeulen, E. P. M. (2018). The future of finance: FinTech, tech disruption, and regulation. European Business Organization Law Review, 19(1), 3–30.
12. Fernandes, D., Lynch, J. G., Jr., & Netemeyer, R. G. (2014). Financial literacy, financial education, and downstream financial behaviors. Management Science, 60(8), 1861–1883.
13. Ghosh, J. (2018). Digital finance and financial inclusion in India. Oxford University Press.
14. Gray, C. (2020). Consumer rights in the digital economy. Routledge.
15. GSMA. (2022). The state of mobile internet connectivity report 2022. GSMA Association.
16. Hair, J. F., Black, W. C., Babin, B. J., &

Anderson, R. E. (2019). Multivariate data analysis (8th ed.). Cengage Learning.
17. ITU. (2022). Global connectivity report 2022. International Telecommunication Union.
18. Klapper, L., Lusardi, A., & Panos, G. A. (2013). Financial literacy and its role in explaining the use of financial products. Journal of Financial Services Research, 47(3), 271–293.
19. Kraemer-Mbula, E., Wunsch-Vincent, S., & Lopez, F. L. (2019). Innovation and the digital economy in developing countries. Springer.
20. Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. Journal of Economic Literature, 52(1), 5–44.
21. Lyons, A. C., & Kass-Hanna, J. (2021). Building financial resilience through financial and digital literacy in South Asia and Sub-Saharan Africa. Emerald Open Research, 3(3), 1–14.
22. Mandell, L., & Klein, L. S. (2009). The impact of financial literacy education on subsequent financial behavior. Journal of Financial Counseling and Planning, 20(1), 15–24.
23. Morgan, P. J., Long, T., & Yoshino, N. (2020). Financial literacy, financial inclusion, and credit behavior: Evidence from Cambodia and Viet Nam. Asian Development Bank Institute.
24. OECD. (2018). G20/OECD INFE policy guidance on digital financial literacy. OECD Publishing.
25. OECD. (2022). OECD/INFE toolkit for measuring financial literacy and financial inclusion 2022. OECD Publishing.
26. Pazarbasioglu, C., Mora, A. G., Uttamchandani, N., Natarajan, H., & Feyen, E. (2020). Digital financial services. World Bank Group.
27. Pew Research Center. (2022). Internet and smartphone adoption in emerging economies. Pew Research Center.
28. Ravikumar, T. S. (2017). Assessing quality of digital financial services: A rural consumer perspective. Indian Journal of Finance, 11(8), 35–48.
29. Ravikumar, T. S., Raghavan, S. V., & Srinivasan, A. (2022). Digital financial inclusion in India: Opportunities and challenges. International Journal of Management Research and Review, 12(2), 45–59.
30. Reserve Bank of India, NPCI, & Ministry of Electronics and IT. (2023). Digital payments progress report. RBI Publications.
31. Shaikh, A., Karjaluoto, H., & Ayoola, P. T. (2023). Mobile financial services adoption and usage. Routledge.
32. Sharma, R., & Chand, A. (2019). Consumer awareness in digital finance. Sage Publications.
33. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.
34. Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1), 157–178.
35. Wellalage, N. H., Ngo, T., & Wu, J. (2021). Financial inclusion, mobile money, and individual welfare: Evidence from developing countries. Technological Forecasting and Social Change, 167, 120–135.
36. World Bank. (2022). The global findex database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19. World Bank Group.
37. Yang, S., Singh, P., & Sharma, P. (2021). Transforming payments in India: The rise of UPI and digital financial services. Journal of Financial Innovation, 7(1), 32–48.
38. Zohar, A. (2019). Bitcoin: Under the hood. Communications of the ACM, 62(9), 104–113.
39. Zycinska, M., & Januszek, M. (2021). Self-determination theory in financial decision making and digital autonomy. Journal of Behavioral and Experimental Finance, 30, 100481.