

Robo-Advisors and Financial Inclusion: The Critical Relationship between Financial Literacy and Adoption

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Abstract

This study investigates the effect of the robo-advisors on financial inclusion, and analyzes the mediation and moderation of financial and digital literacy in the context of India. The Indian fintech space is experiencing a paradoxical situation where, while there is an increase in fintech platforms such as Groww, Kuvera and ET Money, low cost robo-advising services for inclusion are enjoyed mainly by the financially literate urban population. The primary data has been collected from people of Tier-1, Tier-2 and Tier-3 cities of Rajasthan by adopting mixed method and using structured questionnaire. The six objective knowledge items and the six behavioural items were obtained to measure Financial Literacy. The data was analyzed reliability, correlation, regression and mediation-moderation. The results show that there is a positive correlation between financial literacy and the use of robo-advisors. Trust in AI and Perceived Usefulness partially mediate this relationship while Digital Literacy significantly moderates it. Moreover, the Financial Inclusion Scores of robo-advisors users are significantly higher, making robo-advisors a driver towards inclusion by making access more readily available, albeit biased and thus requiring vernacular integrated phygital models.

Keywords: Robo-Advisor, Financial Literacy, Financial Inclusion, Digital Literacy, Trust in AI and Fintech.

Introduction

Financial technology has revolutionized wealth management in the last 10 years. In emerging markets where financial advisors are out of reach for most, robo-advisors—financial advice platforms that rely on algorithms to provide automatic advice and portfolio management—became an attractive option to financial inclusion. The theoretical potential is alluring: With little or no human oversight, the robo-advisors operate at scale and charge a fraction of the advisory fees of their human counterparts, 0.25-0.5% of assets under management, compared to 1-2%. Robo-advisors may bring financial market participation to those who haven't had access in emerging markets such as India where they tend to be more urbanized and wealthy. However, there is a counter-intuitive finding: Financial education, which is one of the most reliable indicators of the use of robo-advisors, is actually lower exactly in those areas where it is most needed. The gap identified in a 2026 systematic review is that future research should examine the reasons why FRAs are not being used by less financially literate people, who are likely to benefit from the use of FRAs more than others. This gap between need and uptake is a market failure and a policy issue - technology does not guarantee financial inclusion. This paper examines financial literacy and the adoption of robo-advisory services as a case study of the role that digital financial

innovations can play in amplifying or reducing inequities. It summarizes the outcome of the latest empirical studies on financial literacy from emerging markets (including India and Southeast Asian countries) and developed markets (including Germany, Sweden and South Korea), as well as cross-national studies, to find answers to the following questions: (1) How does financial literacy influence decision-making processes around robo-advisors? (2) How does financial literacy moderate the relationship between robo-advisor use and financial outcomes? (3) What are the groups most likely to be excluded from robo-advisor use despite their access to technology? (4) What pieces of evidence-based recommendations can be drawn for inclusive robo-advisor design and policy?

Financial Inclusion as a Multidimensional Construct

Contemporary treatments of financial inclusion reject the binary account-ownership definition. RBI index explains the dimensions of financial literacy.

Table 1: Dimensions of Financial Inclusion Applied to Digital Investment Advice

Dimension	Question it Answers	Indicator in this Study
Access	Can the person reach the service at all?	Awareness of the category; device and connectivity; successful completion of onboarding and KYC
Usage	Do they actually transact through it?	Adoption; number of active products; SIP registration
Appropriateness	Is what they hold suitable for them?	Alignment of holdings with stated horizon and risk capacity; concentration; presence of an emergency buffer
Persistence	Do they stay included through stress?	SIP continuation; behaviour during the most recent drawdown; account dormancy

Decomposing Financial Literacy

Table 2: The Three Literacy Constructs and their Expected Roles

Construct	Definition	Measurement	Expected Relation to Adoption
Objective financial literacy (OFL)	Demonstrated knowledge of interest compounding, inflation, diversification, risk–return and liquidity	Eight-item objective test (Lusardi–Mitchell core plus advanced items)	Inverted U
Subjective financial literacy (SFL)	Self-assessed confidence in one's own financial knowledge	Self-rating items on the same domains	Positive, monotone
Digital financial literacy (DFL)	Capacity to use digital financial services competently and to recognise digital financial risk	Knowledge and behaviour items on digital transacting, app permissions, fraud recognition, grievance channels	Positive, monotone; acts as an access threshold
Calibration gap	Standardised SFL minus standardised OFL	Derived variable	Positive with adoption, negative with appropriateness

The calibration gap is the theoretically important derived quantity. A positive gap denotes overconfidence: the person believes they know more than they do. If adoption rises with the gap while appropriateness falls with it, robo-advisory is systematically recruiting the miscalibrated — a finding with direct suitability-regulation implications and one that no unidimensional literacy measure can detect.

Review of Literature

• Financial Literacy and the Demand for Advice

The older literature on *human* financial advice already contains the unresolved version of this question. Some studies find that the financially literate value advice more and seek it more; others find no significant relationship between objective literacy and advice-seeking. The theoretical ambiguity is longstanding: advice can be a substitute for one's own knowledge or a complement to it, and which one

dominates is an empirical matter that depends on the cost of advice, the complexity of the decision, and the investor's position in the knowledge distribution.

Robo-advisors first launched in the US in 2008 post financial crisis, they aimed to democratize wealth management through low-cost, low-minimum investment solutions. [Betterment] [Wealthfront]

D'Acunto et al. argued that robo-advisors reduce behavioural biases and costs compared to human advisors. However, Jung et al. critically noted that robo-advisors suffer from "black-box" problem - users do not understand how advice is generated, leading to trust deficit. In India, platforms like Groww, Kuvera, ET Money, and Scripbox manage over Rs. 50,000 crores AUM as of 2023 [SEBI], but adoption remains urban-centric.

- **Financial Inclusion and Fintech: Optimistic View**

Financial inclusion is defined as access to and usage of affordable, appropriate financial products [World Bank, 2022]. The Global Findex 2021 reported 76% of adults globally have an account, but only 31% in developing economies use it for savings/investment.

Arner et al. proposed FinTech can be the enabler of sustainable financial inclusion through four pillars: infrastructure, enabling regulation, digital identity, and literacy. Gomber et al. supported this, stating robo-advisors lower entry barriers from Rs. 5 lakhs to Rs. 100. RBI Financial Inclusion Index rose from 43.4 in 2017 to 60.1 in 2023, partly attributed to fintech growth [RBI 2023]

Critical Gap: These studies are techno-optimistic. They assume access = inclusion, ignoring capability gap.

- **Financial Literacy: The Missing Link**

Lusardi and Mitchell in their seminal work established financial literacy as ability to understand interest, inflation, risk diversification. Their 3-question scale is used globally. OECD/INFE expanded it to knowledge, behaviour, and attitude. [2014] [2022]

In India, NCFE found only 27% adults are financially literate, with rural literacy at 24% vs urban 33%. found financial literacy positively predicts fintech adoption in India [$\beta = 0.46$, $p < 0.01$]. [2020] [2023]

It is found in some literature that low literacy individuals exhibit algorithm aversion - they prefer human over algorithm even when algorithm performs better. This is critical for robo-advisors. [2021]

- **Financial Literacy and Robo-Advisory Adoption**

Table 3: Divergent Findings on Literacy and Robo-Advisory Adoption

Finding	Representative Evidence	Implied Mechanism
Objective literacy lowers adoption	US investor evidence (Fan & Chatterjee, 2020)	Substitution
Objective literacy raises adoption	Isaia & Oggero (2022)	Complementarity
Subjective and digital literacy raise adoption; objective literacy lowers it	Bank of Italy 2023 survey microdata analyses	Confidence-driven adoption
Adoption driven by subjective literacy and overconfidence	Taiwan national survey evidence	Miscalibration
No significant difference by literacy	Meta-analysis of 41 robo-advisor studies (de Oliveira Santini et al., 2026)	Specification heterogeneity
Financial capability, not knowledge, drives uptake	Latent profile analyses combining knowledge, confidence and perceived control	Capability rather than knowledge

Objectives

- To examine the level of awareness and understanding of robo-advisors among investors.
- To assess the level of financial literacy among investors and identify its key dimensions, such as financial knowledge, financial attitudes, and financial behaviour.
- To examine the adoption and usage patterns of robo-advisors among investors, including factors influencing their willingness to adopt and continue using robo-advisory services.

- To analyse the relationship between financial literacy and the adoption of robo-advisors.
- To examine whether financial literacy significantly influences investors' intention to adopt and use robo-advisors.
- To assess the role of robo-advisors in promoting financial inclusion, particularly by improving access to investment and financial advisory services.
- To examine whether financial literacy acts as a critical factor in determining the contribution of robo-advisors to financial inclusion.
- To identify the major barriers to the adoption of robo-advisors, including lack of financial knowledge, trust, perceived risk, technological barriers, and concerns regarding data privacy.
- To suggest measures for improving financial literacy and encouraging responsible adoption of robo-advisors to enhance financial inclusion.

Hypotheses

- H1:** Financial literacy of investors positively influences adoption of robo-advisors.
- H0₁:** Financial literacy of investors does not positively influence adoption of robo-advisors.
- H2:** Trust mediates between financial literacy and adoption.
- H0₂:** Trust does not mediate between financial literacy and adoption.
- H3:** Digital literacy moderates the relationship between financial literacy and adoption of robo-advisors.
- H0₃:** Digital literacy does not moderate the relationship between financial literacy and adoption of robo-advisors.
- H4:** The adoption and use of robo-advisors significantly contribute to financial inclusion by improving access to investment and financial advisory services.
- H0₄:** The adoption and use of robo-advisors do not significantly contribute to financial inclusion by improving access to investment and financial advisory services.

Research Methodology

• Research Design

The study adopts a Descriptive-cum-Analytical and Causal Research Design with Mixed-Methods Approach.

- Quantitative approach to measure financial literacy and test its relationship with adoption.
- Qualitative approach through interviews to understand barriers faced by low-literacy users.

• Research Approach

Deductive Approach. Based on existing theories - Technology Acceptance Model [TAM], UTAUT2 and OECD/INFE Financial Literacy Framework. Hypotheses are formulated and tested empirically.

• Population

All Indian retail investors and potential investors aged 18 years and above who:

- Have a bank account, and
- Are either existing users or potential users of robo-advisory platforms.

• Sampling Design

- Sampling Technique: Stratified Purposive Sampling to ensure Financial Inclusion perspective.
 - Strata 1 - Location: Tier-1, Tier-2, Tier-3 Cities & Rural
 - Strata 2 - Income: Low [<3 Lakhs], Middle [3-10 Lakhs], High [>10 Lakhs]
 - Strata 3 - Gender & Adoption Status: Male/Female and Adopter/Non-Adopter

- Sample Size:
 - Quantitative: 100 respondents - calculated using Cochran's formula at 95% confidence level, 5% margin of error.
 - Qualitative: 20-25 in-depth interviews with low-literacy non-adopters and fintech experts.
- **Data Collection**
 - Primary Data**

Structured Questionnaire - 5 Sections:

 - Demographics & Financial Inclusion Indicators
 - Financial Literacy Test - 6 questions - Adapted from Lusardi & Mitchell Big 3 + OECD/INFE Toolkit [Objective + Subjective]
 - Digital Literacy Scale [5-point Likert]
 - TAM Constructs - Perceived Usefulness, Ease of Use, Trust in AI, Perceived Risk [15 items, 5-point Likert]
 - Robo-advisor Adoption - Awareness, Intention to Use, Actual Usage, Barriers

Semi-Structured Interviews: To explore trust issues, language barriers, fear of algorithm.
 - Secondary Data**

RBI Financial Inclusion Reports, SEBI Reports, NCFE surveys, World Bank Global Findex, Research papers.
- **Variables and Operational Definition**
 - Independent Variable [IV]: Financial Literacy - Measured as Financial Literacy Index [FLI] - Knowledge 60% + Behaviour 20% + Attitude 20%
 - Dependent Variable [DV]: Robo-advisor Adoption - Adoption Intention and Actual Usage
 - Mediating Variables: Trust in AI, Perceived Usefulness, Perceived Ease of Use
 - Moderating Variables: Digital Literacy, Age, Income, Location
 - Outcome Variable: Financial Inclusion - Access, Affordability, Usage of formal investment advice
- **Measurement Scale**
 - Financial Knowledge: MCQ & True/False - 1 point for correct answer
 - 0-2 = Low, 3-5 = Medium, 6-8 = High Literacy
 - All other constructs: 5-point Likert Scale –
 - 1=Strongly Disagree to 5=Strongly Agree
- **Data Analysis Tools**
 - Reliability & Validity: Cronbach's Alpha [>0.70], Composite Reliability, AVE for convergent validity
 - Descriptive Analysis: Mean, SD, Frequency - to assess literacy levels
 - Inferential Analysis:
 - t-test & ANOVA to compare literacy across demographics
 - Correlation & Multiple Regression
 - Structural Equation Modelling [SEM] using SmartPLS 4 to test mediation-moderation framework
 - Qualitative: Thematic Analysis using NVivo
- **Tools Used**

Google Forms / MS Forms, SPSS 26.0, SmartPLS 4, MS Excel

Ethical Considerations

Informed consent was obtained, anonymity and confidentiality was maintained, regional language translation was provided for low-literacy groups, and no personal financial data was disclosed.

Data Analysis, Results and Discussion

- **Demographic Profile**

Out of 100 respondents, 54% were male, 46% female. 40% Tier-1, 35% Tier-2, 25% Tier-3/Rural. 32% had income <3L.

- **Level of Financial Literacy**

Literacy Level	Score 0-8	Respondents	Percentage
Low	0-2	28	28%
Medium	3-5	42	42%
High	6-8	30	30%

Mean Financial Literacy Index [FLI_%] = 56.4%. This shows medium-low literacy, consistent with NCFE 2019 report which found only 27% financially literate.

Key Gap: Mean B Total for Tier-1 = 5.8 vs Tier-3 = 3.1 [$p < 0.01$]. This proves financial inclusion gap at geographic level.

- **Reliability Test**

Construct	Items	Cronbach Alpha
Digital Literacy	D1-D4	0.84
Perceived Usefulness	E1-E2	0.81
Trust in AI	E5-E6	0.88
Adoption Intention	F1-F2	0.87

All Alpha > 0.70, hence reliable.

- **Hypothesis Testing**

H1: Financial Literacy positively influences Robo-advisor Adoption

Pearson Correlation between Financial Literacy Index % and Financial literacy Adoption: $r = 0.68$, $p < 0.001$

Linear Regression: $R^2 = 0.56$. Beta = 0.52, $p < 0.001$.

H1 Accepted. 56% variation in adoption is explained by financial literacy. A person with high literacy [7-8 score] has adoption intention of 4.3/5 vs low literacy [1-2 score] has 1.6/5.

This aligns with Lusardi & Mitchell who stated literacy is prerequisite for fintech adoption.[2014]

H2: Trust mediates between Financial Literacy and Adoption

SEM using SmartPLS:

FinLit -> Trust Beta = 0.61, $p < 0.001$

Trust -> Adoption Beta = 0.58, $p < 0.001$

Direct FinLit -> Adoption after mediation Beta = 0.21 [reduced from 0.52]

Partial mediation confirmed. Reason: Low-literacy users don't understand algorithm, hence they don't trust.

H3: Digital Literacy Moderates the Relationship

Moderation analysis: Interaction effect FinLit*DigitalLit -> Adoption Beta = 0.34, $p < 0.01$.

Interpretation: Even if financial literacy is high, if digital literacy is low [D_Avg < 2.5], adoption remains low at 2.2/5. Both literacies needed.

H4: The adoption and usage of robo-advisors significantly contribute to financial inclusion by improving access to investment and financial advisory services.

We measured Financial Inclusion as a composite index of 3 indicators from the questionnaire. Financial Inclusion Score [FIS] -

- **Access:** A6 - Do you have Demat/MF account? [0=No, 1=Yes]
- **Usage:** F1 - Adoption Intention of robo-advisors [1-5 Scale]
- **Quality/Behaviour:** Average of C1-C4 [Budgeting, timely payments, emergency fund] [1-5 Scale]

Formula used in SPSS:

$$\text{FIS} = (\text{Access}_{20}) + (\text{F}_{\text{Adoption}}/5_{40}) + (\text{C}_{\text{Avg}}/5_{40}) = \text{Score out of 100}$$

- FIS <40 = Financially Excluded
- 40-70 = Semi-Included
- >70 = Financially Included

Results for H4

- **Test Used:** Independent Sample T-test + Linear Regression
- **Group 1:** Robo-advisor Users [A7=Yes, n=48]
- **Group 2:** Non-Users [A7=No/Heard only, n=52]

Indicator	Users Mean	Non-Users Mean	T-value	p-value
Has Demat/MF Account	89%	41%	9.4	<0.001
Investment Frequency [per year]	8.2 times	1.4 times	11.2	<0.001
Advisory Access Cost [Rs.]	Rs. 0-99 / year	Rs. 5000+ for human advisor	-	-
FIS Total [0-100]	76.8	42.3	13.6	<0.001

Regression: F_Adoption -> FIS

Beta = 0.71, R² = 0.51, p < 0.001

Result: H4 ACCEPTED.

The results strongly prove that robo-advisors are contributing to financial inclusion, but conditionally.

Barriers - For Financial Inclusion Discussion

From Question F3:

- Lack of knowledge: 38%
- Lack of trust in AI: 29%
- Language issue / Complex English interface: 18%
- Prefer human advisor: 15%
- **This is the PARADOX OF FINTECH INCLUSION:** Robo-advisors were designed to include low-income, low-literacy people at low cost [Rs.100 starting], but the same low-literacy people are unable to adopt due to lack of trust and understanding.
- **Discussion:** SEBI's 2023 report shows 76% of robo users are from Tier-1 with high literacy. Our study proves why. World Bank Global Findex says digital delivery can improve inclusion only when paired with literacy programs.

Conclusion, Implications & Recommendations

Conclusion

The study concludes that there is a critical and strong positive relationship between financial literacy and robo-advisor adoption. Financial literacy is not just a factor, it is the gateway for financial inclusion via robo-advisors.

The research found three layers of literacy required:

- Basic Financial Literacy [what is NAV, inflation]
- Digital Literacy [how to use app safely]
- Algorithmic Literacy [how to trust AI advice]

Without layer 1 and 2, layer 3 fails. Hence, current robo-advisors are increasing the gap - benefiting the already included.

Practical Implications & Recommendations

For Fintech Companies [Groww, Kuvera, ET Money]:

- Vernacular Interface: Add Hindi, Tamil, Rajasthani audio explainers, not just English text.
- Literacy-first Onboarding: 2-min animated video on "What is Mutual Fund" before showing recommendation.
- Trust Features: Show SEBI registered badge, explain "Why this fund is recommended for you" in simple language.

For Regulators [SEBI][RBI][NCFE]:

- Integrate robo-advisor demo in Financial Literacy camps in Tier-3.
- Mandate "Explainability Score" for robo-advisors similar to risk-o-meter.

Scope for Future Research

- Longitudinal study - Does literacy training increase adoption after 6 months?
- Comparative study - India vs US robo-advisor adoption.
- Experimental study - Testing vernacular vs English interface on Tier-3 users.

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