

Leveraging Digital Technology to Enhance Financial Inclusion through Microfinance in Tamil Nadu

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Financial inclusion remains a critical challenge in developing regions, with many individuals lacking access to essential financial services. This study examines the potential of digital technology to enhance financial inclusion through microfinance in Tamil Nadu, India. The research investigates the impact of digital technology adoption on financial inclusion outcomes, considering the moderating effects of digital literacy and awareness among microfinance clients. The study employs a mixed-methods approach, combining quantitative surveys with qualitative interviews to gather comprehensive data from microfinance institutions and their clients in Tamil Nadu. The research utilizes a conceptual framework based on the Financial Inclusion Framework, incorporating digital technology as a key factor in improving access, usage, and quality of microfinance services. The study hypothesizes that digital technology adoption has a significant positive impact on financial inclusion through microfinance in Tamil Nadu, with digital literacy and awareness playing a moderating role. Data analysis will involve descriptive statistics, correlation analysis, and regression modeling to test the hypotheses and examine the relationships between variables. The findings are expected to provide valuable insights into the role of digital technology in enhancing financial inclusion and inform policymakers, microfinance institutions, and technology providers on effective strategies for leveraging digital solutions in the microfinance sector. This research contributes to the growing body of literature on digital financial services and financial inclusion, offering practical implications for improving access to financial services for underserved populations in Tamil Nadu and similar contexts.

Keywords: Financial Inclusion, Digital Technology, Microfinance, Tamil Nadu, Digital Literacy, Digital Payments

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1. Introduction

Financial inclusion remains a critical challenge in developing economies, particularly in rural and underserved areas. In Tamil Nadu, a state in southern India, microfinance institutions have played a significant role in extending financial services to marginalized populations. However, traditional microfinance models face limitations in reach, efficiency, and scalability. The advent of digital technology presents a transformative opportunity to overcome these barriers and revolutionize the microfinance sector. This study explores the potential of leveraging digital technologies to enhance financial inclusion through microfinance initiatives in Tamil Nadu. By examining the intersection of digital innovation and microfinance, this research aims to: .Assess the current state of digital technology adoption in Tamil Nadu's microfinance sector. Identify key digital tools and platforms that can amplify the impact of microfinance services. Analyze the challenges and opportunities in implementing digital solutions for financial inclusion. Propose strategies for integrating digital technologies into existing microfinance frameworks. Evaluate the potential socio-economic benefits of digitally-enhanced microfinance services. This study's findings will contribute to the growing body of knowledge on digital financial inclusion and provide actionable insights for policymakers, microfinance institutions, and technology providers seeking to bridge the financial inclusion gap in Tamil Nadu and similar developing regions.

During 2023-24, the growth in loans outstanding under SHG-BLP was 38% while gross loan portfolio under a registered a growth of 16.21%. This growth has primarily been on account of several initiatives and interventions by State Governments, RBI, NABARD, Banks, SRO with particular focus on supporting microenterprises by SHGs/ JLGs. Cumulatively, the grant support sanctioned and released under FIF for promotion and nurturing of SHGs as on 31 March 2024 stood at ₹428.60 crore and ₹181.39 crore respectively. The cumulative number of SHGs savings linked under stood at 6.96 lakh of which credit linked SHGs were 4.15 lakh. In a developing country like India, there is a need to support low-income families as well as uplift and provide them with a better standard through supporting them financially in a more efficient way, and there came the concept of "microfinance,"

which is a form of financial service that provides small loans and other financial services to poor and low-income households in a consistent and legitimate way. Sharma (2019) explores the impact of digital banking on financial inclusion, arguing that technology can bridge the gap between underserved populations and financial services, thus enhancing overall economic participation. Reddy and Kumar (2020) analyze the role of government policies in promoting financial literacy, emphasizing that informed consumers are more likely to engage with financial institutions, which is crucial for achieving financial inclusion. Joshi (2021) investigates the effectiveness of microfinance institutions in rural areas, concluding that they play a significant role in providing credit to low-income households, thereby fostering entrepreneurship and self-sufficiency. Patel (2021) discusses the challenges faced by women in accessing financial services, highlighting that targeted interventions are necessary to empower women economically and promote gender equality in financial inclusion.

2. Literature Review

Mrs. J. Angel Priya (2024) emphasizes the critical role of financial inclusion in empowering marginalized communities, particularly women, in Tamil Nadu. Her study focuses on the evaluation of financial inclusion through Self-Help Groups (SHGs) across various districts in Tamil Nadu. She highlights three dimensions of financial inclusion: banking penetration, availability of banking services, and banking disbursement, which together form the Financial Inclusion Index (FII). The findings reveal significant disparities in financial inclusion across districts, with only three districts achieving a high FII score, while the majority exhibit poor inclusion levels. Angel Priya calls for increased governmental initiatives to enhance financial services and banking accessibility through SHGs. She also stresses the need for awareness programs to educate SHG members on banking products, aiming to improve their financial literacy and participation in the formal financial system.

Sankharaj Roy, H. Ramananda Singh, and Ranjit (2017) examined the factors influencing financial inclusion among Self-Help Group (SHG) members in Tripura. They identified six key factors affecting financial inclusion: suitability of financial products, ease of banking, physical infrastructure, economic status, IT infrastructure, and financial awareness.

These factors were derived through principal component analysis applied to data collected from 384 SHG members across 95 SHGs. The study highlighted that financial inclusion is essential for sustainable growth, particularly in economically underdeveloped regions like Tripura. Despite efforts through programs like the SHG-Bank Linkage, many SHG members remain financially excluded. Specifically, the study found that 19% of members fell into the "very low" financial inclusion category, while 46.1% experienced "low" levels of financial inclusion.

Dr. Shirsendu Mukherjee's (2019) study highlights the effectiveness of Joint Liability Group Lending (JLGL) in enhancing financial inclusion, especially for marginalized groups in India. JLGL leverages peer monitoring and social sanctions to address issues like moral hazard and adverse selection, which often hinder traditional lending. NABARD's initiatives, such as the Self-Help Group-Bank Linkage Program (SHG-BLP), have successfully connected millions of rural households to formal banking systems. These programs empower individuals, particularly women, by offering credit without collateral, fostering entrepreneurship, and reducing poverty. The approach has proven cost-effective and impactful in reaching underserved communities, promoting financial inclusion, and contributing to economic growth.

Mahesh K. M., P. S. Aithal, and Sharma K. R. S. (2023) examines the impact of Digital Financial Inclusion (DFI) initiatives on self-help groups (SHGs) and their role in sustainable development. The research highlights how digital platforms like NABARD's E-Shakti, UPI, and government programs such as Pradhan Mantri Jan-Dhan Yojana (PMJDY) have revolutionized access to financial services for marginalized communities. These initiatives address traditional barriers like geographical distance, limited financial literacy, and lack of banking facilities by introducing digital tools and platforms. SHGs, primarily composed of women, have benefited significantly from these advancements, gaining financial independence and contributing to economic growth and poverty alleviation. The study emphasizes the alignment of SHG-led initiatives with Sustainable Development Goals (SDGs), particularly in promoting gender equality, financial literacy, and entrepreneurial growth, showcasing how technology-driven financial inclusion fosters social and economic empowerment.

Sankharaj Roy, H. Ramananda Singh, and Ranjit Singh (2017) explores the factors influencing financial inclusion among self-help group (SHG) members in Tripura. Based on data from 384 SHG members across 95 SHGs, the research identifies six key determinants: the suitability of financial products, ease of banking, physical infrastructure, economic status, IT infrastructure, and financial awareness. The study emphasizes the importance of improving accessibility and usability of financial services, addressing challenges such as lengthy documentation, inadequate IT infrastructure, and a lack of business correspondents in rural areas. Additionally, it highlights the role of socioeconomic factors like income and landholding in promoting financial inclusion. The authors stress the need for enhanced financial literacy and counseling to empower SHG members, providing actionable insights for policymakers, financial institutions, and stakeholders to advance financial inclusion in the northeastern region of India.

Dr. G. Yoganandham, Mrs. D. Varalakshmi, and Ms. M. Kalaivani (2024) explored the impact of financial inclusion on women's empowerment in Northwestern India. They highlighted how cultural norms, limited financial literacy, and inadequate access to services hinder women's economic independence. The study emphasized the transformative role of financial literacy programs, microfinance, and digital banking solutions in breaking barriers and fostering economic resilience. By addressing systemic inequalities and integrating financial services with broader development interventions, the authors underscored the potential for sustainable growth and gender equality.

3. Scope of the Study

This research examines the scope and impact of digital technology on financial inclusion through microfinance in the context of Tamil Nadu, India. The scope is geographical on Tamil Nadu but could extend to similar developing regions. The population of interest are microfinance clients, for instance, from the low-income populations that could be women, small-scale entrepreneurs, or rural dwellers; these together with the microfinance institutions make the populations. The key areas of research are the adoption of digital technology in microfinance, outcomes of financial inclusion (access, usage, and quality of services),

and the moderating factors such as digital literacy and awareness. The mixed-methods approach of the study uses both quantitative surveys and qualitative interviews for comprehensive data collection. It analyzes current and recent trends of digital technology adoption within microfinance. This will, besides augmenting the knowledge base about how digital financial services might be integrated into microfinance, offer practical recommendations to policymakers and microfinance institutions as well as to the providers of technology. The findings thus shall be applicable in the cases of Tamil Nadu and so shall both offer theoretical as well as practical insight. The research on digital technology adoption in microfinance in Tamil Nadu faces several

4. Research Gap

The research on the adoption of digital technology in microfinance in Tamil Nadu has its own sets of limitations and suggests possible areas of research. A sample size of 149 respondents, although very helpful in establishing insights, cannot comprehensively account for the heterogeneity in microfinance clients' demographic, socioeconomic, and cultural parameters across the state. Regional variations, therefore, will not be considered, wherein financial inclusion and the adoption of digital technology could differ widely in the distant or non-reached parts. Moreover, the data collected during the study using self-reports from the surveys and interviews is subject to bias; respondents might exaggerate over their knowledge or use of digital financial services. The study's cross-sectional design limits ability to infer causality or tracing changes in time, as well as limiting the extent to which long-term changes or impacts from emerging technologies and policy interventions are represented by the time span chosen for the study. The study does not probe deeper on infrastructural challenges like internet connectivity and penetration of smartphones, which could have very enormous effects on the adoption of digital technology. Concentration on clients and some insight from microfinance institutions may not be sufficient to give an all-rounded institutional perspective on the challenges of implementing digital solutions. These areas can be filled by further research through increased sample size and geographic scope, through the use of longitudinal designs, and through examination of infrastructural challenges' impacts on the adoption of digital technology.

Further, cultural and behavioral barriers especially in underrepresented groups, such as women or older populations, may be researched to better understand the factors that influence digital technology adoption in microfinance. More research can also explore the institutional views and issues of microfinance institutions in implementing digital solutions as well as how some exogenous factors such as economic changes, changes in regulatory requirements, and other influential events on a world scale can impact digital behavior about finance.

5. Research Methodology

1. Research Design: The study adopts a mixed-methods research design, combining both qualitative and quantitative approaches. This design ensures comprehensive data collection and analysis to address the research objectives effectively.

Qualitative Data: These are gathered through semi-structured interviews with key stakeholders including representatives from microfinance institutions, technology providers.

The research design for this study is mixed methods. This combines qualitative and quantitative approaches, thus making sure that all the objectives are well covered in the collection and analysis of data.

2. Study Area: This study will be carried out on the state of Tamil Nadu, Tamil Nadu's socio-economic and cultural environment is very diversified. Therefore, it becomes an excellent location to examine the effects of digital technology on financial inclusion through microfinance.

3. Population and Sampling: Target Population: Microfinance clients, for example, women, small-scale entrepreneurs, and rural dwellers, and microfinance institutions in Tamil Nadu.

Sample Size: Total number of respondents for the study is 149. These include microfinance clients who avail digital financial services and representatives from microfinance institutions.

Sampling Technique: Stratified random sampling technique was adopted in the study to ensure that the sample reflects different demographic, socio-economic, and regional groups.

4. Quantitative Data: Through the structured surveys.

5. Research Instruments: Questionnaire Surveys: These are structured towards gathering information from relevant variables, which will encompass the adoption of digital technology, metrics of financial inclusion that cut across access, usage, and quality, and digital literacy.

6. Data Collection Methods: Interview Guide: For conducting semi-structured interviews for greater insight into challenges and opportunities surrounding digital technology adoption in microfinance.

Objectives:

1. To examine the impact of digital technology on financial inclusion through microfinance in Tamil Nadu.
2. To investigate the role of digital technology in improving access to microfinance services for underserved populations in Tamil Nadu.
3. To analyze the moderating effects of digital literacy and awareness on the relationship between digital technology and financial inclusion.

Hypothesis:

H0: Digital technology has no significant impact on financial inclusion through microfinance in Tamil Nadu.

H1: Digital technology has a significant positive impact on financial inclusion through microfinance in Tamil Nadu.

Variables

Dependent Variable: Financial Inclusion (FI) through microfinance in Tamil Nadu (e.g., access to savings, credit, insurance, and payment services)

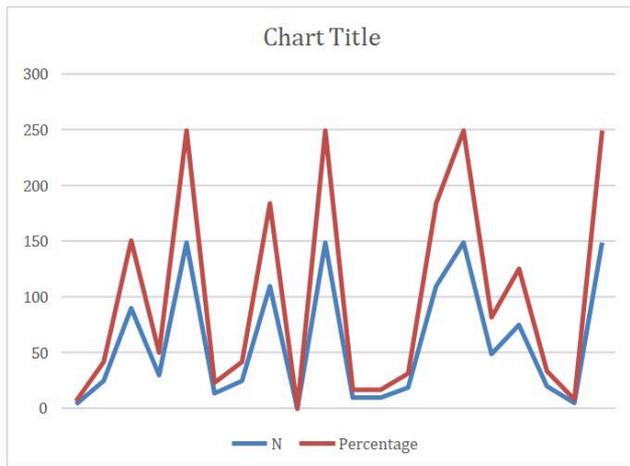
Independent Variable: Digital Technology Adoption (DTA) in microfinance (e.g., mobile banking, digital payments, online loan applications)

Moderating Variable: Digital Literacy and Awareness (DLA) among microfinance clients (e.g., ability to use digital devices, understanding of digital financial services).

6. Demographic Profile of the Respondent

Demographic factors		N	Percentage
Age	20-30	4	2.68
	31-40	25	16.78
	41-50	90	60.41
	51-60	30	20.13
	Total	149	100
Education	Primary school	14	9.40
	Secondary school	25	16.78
	Under graduate / Post graduate	110	73.82
	Total	149	100
	Agriculture	10	6.78
	Small business	10	6.78
Occupation	Homemaker	19	12.75
	Daily wage laborer	110	73.69
	Total	149	100
Monthly Income	Below 20000	49	32.89
	21000-30000	75	50.34
	31000-40000	20	13.42
	Above 50000	5	3.36
	Total	149	100

The age group 41-50 years dominates at 60.41%, representing a predominantly middle-aged sample population. In education, 73.82% have undergraduate or postgraduate degrees, indicating a highly educated respondent base. For occupation, daily wage laborers form the largest segment at 73.69%, showing this is the primary employment type. Regarding monthly income, the ₹21,000-30,000 bracket represents 50.34% of respondents, indicating a moderate income level is most common among the surveyed population. This reveals a potential mismatch between education qualifications and employment opportunities, with most respondents falling in middle-income brackets despite high education levels.



Correlation

Hypothesis:

H₀: There is no significant relationship between digital technology adoption (DTA) in microfinance for SHGs and financial inclusion (FI) among SHGs in Tamil Nadu. **H₁:** There is a significant positive relationship between digital technology adoption (DTA) in microfinance for SHGs and financial inclusion (FI) among SHGs in Tamil Nadu.

CORRELATION		DZ	IDV
	Pearson Correlation	1	.627**
DZ	Sig. (2-tailed)		.000
	N	149	149
	Pearson Correlation	.627**	1
IDV	Sig. (2-tailed)	.000	
	N	149	149

Correlation Coefficient (0.627):

- Pearson correlation coefficient of the dependent variable FI with the independent variable DTA was **627**.
- This suggests a **Moderate positive** relationship between DTA and Greater adoption of digital technology is related to SHGs having better financial inclusion.
- The p-value is less than 01, confirming that the observed correlation is statistically
- Significant at the 99% confidence
- The sample size is 149, which is large enough to detect a meaningful relationship in this context. So, null hypothesis (H₀₁) is rejected and alternate hypothesis (H₁₁) is accepted.

7. Reliability Test

Source: Primary Data

Variables	Scale Items	Cronbach's Alpha
Digital Literacy among SHG members	6	0.812
Financial Inclusion	6	0.834
Digital Technology Adoption	6	0.846

The provided data shows Cronbach's Alpha values for three variables: Digital Literacy among SHG members, Financial Inclusion, and Digital Technology Adoption. Each variable is measured using 6 scale items. The Cronbach's Alpha values are 0.812, 0.834, and 0.846 respectively. These values indicate high internal consistency and reliability for all three scales. Generally, Cronbach's Alpha values above 0.7 are considered acceptable, with values above 0.8 indicating good reliability. In this case, all three have good to excellent reliability, which ensures that the items in every scale are measuring the same underlying construct with good consistency. High reliability, thus, is a very vital contributor to the credibility of the measurements and quality of the research instrument.

Regression

Null Hypothesis (H₀): Digital Technology Adoption (DTA) in microfinance does not significantly influence Financial Inclusion (FI) among SHGs in Tamil Nadu.

Alternative Hypothesis (H₁): Digital Technology Adoption (DTA) in microfinance significantly influences Financial Inclusion (FI) among SHGs in Tamil Nadu

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.415a	.172	.167	1.53459

a. Predictors: (Constant), IDV

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	72.127	1	72.127	30.627	.000b
Residual	346.182	148	2.355		
Total	418.309	149			

a. Dependent Variable: DV

b. Predictors: (Constant), IDV

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	19.933	1.329	.415	14.999	.000	17.307	22.560
IDV	.285	.051		5.534	.000	.183	.387

a. Dependent Variable: DV

The analysis shows that **Digital Technology Adoption has a significant positive impact on Financial Inclusion** among SHGs in Tamil Nadu. For every increase in technology adoption, financial inclusion improves slightly. Since the p-value is 0.000 (less than 0.05), the impact is statistically significant, meaning the results are reliable.

Alternative Hypothesis (H₁): Digital Technology Adoption (DTA) **positively and significantly** influences Financial Inclusion (FI) among SHGs in Tamil Nadu. This hypothesis aligns with the regression results, which indicate a significant positive relationship (p-value = 0.000) between DTA and FI. It is the best fit because the analysis confirms that as DTA increases, FI also improves.

8. Discussion

The findings of this study provide strong evidence of the significant role that digital technology adoption (DTA) plays in enhancing financial inclusion (FI) among self-help groups (SHGs) in Tamil Nadu. The Pearson correlation coefficient of 0.627 indicates a moderate positive relationship between DTA and FI, suggesting that greater adoption of digital technology corresponds to improved financial inclusion. The correlation analysis confirms that this relationship is statistically significant at the 99% confidence level (p-value < 0.01). Further, the regression analysis shows that DTA has a significant positive impact on FI, as evidenced by the standardized coefficient (Beta = 0.415) and a p-value of 0.000. This indicates that for every unit increase in digital technology adoption, there is a measurable improvement in financial inclusion. Although the R-squared value (0.172) suggests that only 17.2% of the variation in financial inclusion is explained by digital technology adoption, it highlights the potential of other factors contributing to financial inclusion. The results of the one-way ANOVA further underline the diversity in preferences for digital payments among groups, with a statistically significant difference (p-value = 0.001).

This suggests that digital payment adoption varies across SHGs, influenced by factors such as digital literacy, infrastructure, and access to resources. The combined results from the correlation, ANOVA, and regression analyses indicate a robust relationship between digital technology adoption and financial inclusion. These insights underscore the importance of integrating digital solutions to empower SHGs and drive their financial inclusion.

9. Suggestion and Recommendations

Stakeholders, including policymakers and microfinance institutions, should focus on enhancing digital literacy among SHG members. Conducting workshops and training programs can ensure they understand and effectively use digital platforms. The government and private entities should collaborate to improve access to digital technology, especially in rural areas. Ensuring stable internet connectivity and affordable digital devices can significantly increase technology adoption. Microfinance institutions should design user-friendly, region-specific digital tools tailored to the unique needs of SHGs. This could include mobile apps with vernacular language support and simplified interfaces. Offering incentives such as lower transaction costs or rewards for digital transactions can encourage SHGs to adopt and use digital technologies more frequently. Policymakers should introduce initiatives that integrate digital technology into microfinance programs. These initiatives should also address barriers like cybersecurity concerns and lack of trust in digital platforms. Continuous monitoring and evaluation of the impact of digital adoption on financial inclusion are essential. This will help identify gaps and areas for improvement, ensuring the sustainable empowerment of SHGs through digital means.

10. Conclusion

The study demonstrates a significant positive relationship between digital technology adoption and financial inclusion among Self-Help Groups (SHGs) in Tamil Nadu. The correlation analysis reveals a moderate positive association (r = 0.627) between digital technology adoption and financial inclusion, statistically significant at the 99% confidence level. Regression analysis further confirms this relationship,

with digital technology adoption explaining 17.2% of the variance in financial inclusion. The research highlights the importance of digital literacy, with Cronbach's Alpha values indicating high reliability for scales measuring digital literacy (0.812), financial inclusion (0.834), and digital technology adoption (0.846) among SHG members. The demographic profile reveals a predominantly middle-aged, highly educated sample population, with a majority engaged in daily wage labor despite their educational qualifications. These findings underscore the potential of digital technology in enhancing financial inclusion through microfinance in Tamil Nadu. However, the results also suggest that other factors contribute to financial inclusion, warranting further investigation. The study recommends focused efforts to improve digital literacy, enhance digital infrastructure, develop user-friendly digital tools, and implement supportive policies to leverage digital technology for greater financial inclusion among SHGs. Future research should explore additional factors influencing financial inclusion, consider longitudinal designs to track long-term impacts, and investigate regional variations within Tamil Nadu. This study contributes valuable insights for policymakers, microfinance institutions, and technology providers in developing strategies to enhance financial inclusion through digital means in Tamil Nadu and similar contexts.

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