International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 10 Issue 5, Sep-Oct 2026 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Role of Microfinance and Digital Banking in Empowering Rural Women Entrepreneurs: An Empirical Study of Sahibganj

Sandhya Shashi Xaxa[1], Dr. Neelu Lamba[2]

[1]M.Com, Finance, Nirwan University, Jaipur, Rajasthan, India
[2]Business Studies, Nirwan University, Jaipur, Rajasthan, India

ABSTRACT

While women entrepreneurs are contributing significantly to rural economic development, restricted access to formal financial services and digital financial technologies are still impacting the entrepreneurial empowerment of rural women. The study looks into the contribution of Microfinance and Digital Banking towards empowering rural women entrepreneurs in Sahibganj, India. A quantitative cross sectional research design was used and data collection was done from 300 rural women entrepreneurs by using a structured questionnaire. Multi-item constructs were used to measure Microfinance, Digital Banking, and Entrepreneurial Empowerment. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the collected data. The measurement model showed good reliability and validity with satisfactory indicator loading, composite reliability, average variance extracted, and discriminant validity. The structural results shows that Microfinance has significant positive effect on Entrepreneurial Empowerment with (β =0.384, t=5.408, p<0.001) which supports H1. In addition, Digital Banking has a significant positive impact on Entrepreneurial Empowerment (β=0.452, t=6.647, p<0.001) and this result validates H2. The impact of Digital Banking was relatively stronger than Microfinance. The model accounted for 58.9% of the variance in Entrepreneurial Empowerment (R^2=0.589) and had predictive relevance (Q^2=0.421). The results indicate that providing microfinance and effectively utilising digital banking can enhance the financial autonomy, business decision-making and entrepreneurial ability of rural women. The study adds to the literature by exploring the financial inclusion of traditional and digital financial services in an integrated empirical approach and offers implications for financial institutions, policy makers and organizations that facilitate the financial inclusion of rural women entrepreneurship.

How to cite this paper: Sandhya Shashi Xaxa | Dr. Neelu Lamba "Role of Microfinance and Digital Banking in Empowering Rural Women Entrepreneurs: An Empirical Study of Sahibganj" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-10 | Issue-5, October 2026, pp.669-680, URL: www.ijtsrd.com/papers/ijtsrd142144.pdf

IJTSRD142144

Copyright © 2026 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (http://creativecommons.org/licenses/by/4.0)

KEYWORDS: *Microfinance, Digital Banking, Rural Women Entrepreneurs, Entrepreneurial Empowerment, Financial Inclusion, PLS-SEM, Sahibganj.*

I. INTRODUCTION

In the context of financial inclusion and women's entrepreneurship, microfinance and digital banking are emerging tools to advance the goals. From a financial inclusion and women's entrepreneurship perspective, microfinance and digital banking are rapidly gaining relevance. Incorporation to formal monetary providers allows women to take out credit, save cash, make payments, handle cash monetary risks, and invest cash into earnings activities, if not for the monetary providers, women can and can do this. If not the monetary service providers, women can take out credit, save money, make payments, manage cash monetary dangers and invest cash into earnings activities. In rural regions, however, there are several factors that can hinder women's ability to access credit, including low access to collateral, poor financial education, low mobility, weak banking services, and socioeconomic constraints faced by women [1,2].

Some of those constraints can be overcome by bringing to market small-scale credit and savings services to underserved groups, and by using agent banking, mobile banking, digital payments and electronic financial services to increasingly ease geographical and transaction barriers [3]. Financial

inclusion has recently been found to help empower women in terms of their economic participation, however financial inclusion is not always sufficient to produce an empowering effect in an entrepreneurial environment [4].

Microfinance has robustly shown strong linkages with women's entrepreneurial growth and economic empowerment. Some empirical findings from rural India suggest that the involvement in MFIs and Self-Help Groups (SHGs) can enhance the economic, social and psychological empowerment of women, as they gain greater financial independence, family decision-making power, social engagement and prospects to entrepreneurship [5]. The experience of Pakistan also indicates that microfinance leads to improvement in women's entrepreneurial appetite, business growth, income generation, and poverty alleviation [6]. The impact is not always evenly spread, however, on all of the dimensions of welfare. Studies on rural women borrowers in Pakistan, for instance, revealed that MF loans had positive impact on income and income diversification, however, the overall impact on the broader household welfare outcomes were negligible [7].

The results also point towards the fact that using credit is not sufficient; the use of microfinance and women's own involvement in decision making about their business has an important influence on its performance.

II. Literature review

There is an indirect pathway for financial inclusion to have an impact on women entrepreneurship via digital banking. Digital financial services can decrease the cost and time needed to access the financial institutions, enable electronic financial transactions, enhance the availability of financial information, and allow the management of business transactions anywhere. Yangs et al. [8] identified a positive link between digital financial inclusion and the rate of women entrepreneurs ($\beta = 0.131$, SE = 0.041, $p < 0.01$) which statistically confirms that digital financial inclusion has a positive influence on reducing the availability of finance and information for female entrepreneurs. However, rural women may have access issues with smartphones and internet services, affordability issues, cyber security concerns, and sociocultural constraints that affect their ability to effectively use digital financial tools [2,9]. So, the pairing of microfinance with digital banking needs to be given a lot more attention as microfinance can help provide productive capital and digital banking can enhance access, efficiency and management of financial resources.

Even as there continues to be strong evidence linking financial inclusion with women entrepreneurship, there is still significant empirical research gap. Past research is mainly focused on microfinance or digital financial inclusion alone and focuses little on their complementary role on entrepreneurial empowerment. Furthermore, the context of the studies has tended to be financial literacy, access to credit or enterprise performance, rather than multidimensional empowerment related to financial independence, control on resources, decision making, self-financing and entrepreneurial confidence [4,10].

Some local data is also available in relation to rural women entrepreneurs in Sahibganj; the environmental factors, such as socioeconomic factors, financial inclusion, digitalization and socio-cultural system, can influence the productivity of financial service. Thus, the present study explores the impact of microfinance and digital banking on empowering the rural women entrepreneurs at Sahibganj. The study attempts to empirically establish the link between entrepreneurial empowerment, microfinance, and digital banking through statistical analysis and identify empirical evidence for their relation to help designing financial interventions which support financial inclusion and are gender sensitive in nature.

Empirical Literature Review

There is ample empirical evidence indicating the relationship between access to microfinance and women's entrepreneurship and empowerment in recent years. Pandhare et al. [1] studied the rural women involved in Self-Help Groups in India and concluded that the women's microfinance and entrepreneurial participation had positive association with economic, social and psychological empowerment among rural women. It found that microfinance can go beyond credit provision and can help women to achieve various aspects of empowerment, such as financial inclusion, household decision-making, social engagement, and self-confidence. In the same way, empirical studies on microfinance services revealed that access to finance was found to have a positive influence on entrepreneurship development ($\beta = 0.300$, $p < 0.001$), and microfinance savings services were found to have a stronger positive influence ($\beta = 0.413$, $p < 0.001$) [2]. The results suggest that credit and savings can be a key tool in enhancing the entrepreneurial ability of women.

The positive correlation between microfinance and women's economic status is also supported by evidence from Pakistan. The study by Farooq et al. [3] revealed that microfinance played a significant role in promoting entrepreneurial inclination, business

development and poverty alleviation among women entrepreneurs enrolled in microfinance and enterprise development programme in Pakistan. Results indicate that financial capacity can be improved to facilitate women's involvement in and persistence with income generating activities. In a similar study, Malki et al. [4] analyzed 463 rural women borrowers in Pakistan, and found that women borrowers who used microfinance for microenterprise activities had a significantly higher income and more diversified income sources than the comparable borrowers. The study, however, indicated that the effects were rather limited on some broader indicators of household welfare, which could mean that the effects of microfinance can differ depending on the indicator studied. This is significant as it shows that access to finance is not necessarily leading to comprehensive empowerment.

Another important factor of the digital financial inclusion is the entrepreneur's gender. The study by Yang et al. [5] on the impact of digital financial inclusion on female entrepreneurship also found that the digital financial inclusion has a positive impact on the women's entrepreneurial activities ($\beta = 0.131$, SE = 0.041, $p < 0.01$). They found that the digital financial inclusion can lower financing constraints, enable access to information, enhance financial flexibility, and help entrepreneurs in decision-making. The study also calculated that an increase of one standard deviation in digital financial inclusion raised the odds of women becoming entrepreneurs by around 4.5% [5]. The results indicate that digital banking can augment traditional financial services, thereby addressing geographical and transactional constraints which disproportionately impact women in rural or under-reached areas.

Research on micro and small enterprises also backs up the importance of digital financial services. Johri et al. [6] concluded that digital financial inclusion enabled microenterprises to operate with ease as it streamlined financial transactions and provided greater ease of access to formal financial services. The advantages of digital banking, however, rely heavily on users' access to and their ability to use digital technologies. In their systematic review of financial inclusion literature, Saluja et al. [7] found financial literacy, technological factors, socioeconomic conditions, institutional constraints and gender constraints as key constraints on women's effective engagement with formal financial systems. Digital banking should not be understood as simply a technological enabler, but an entrepreneurial catalyst; women's access to digital financial services is expected to have an impact if they have knowledge, resources, confidence and autonomy in using them.

Recent literature also highlights that empowerment of women is a multi-dimensional phenomenon. Based on a systematic review of microfinance and women entrepreneurs' empowerment, Kivalya and Caballero-Montes [8] proved that empowerment has many facets such as access to resources, control over financial assets, decision-making authority, entrepreneurial autonomy and economic independence. According to their review, future studies should extend their definition of empowerment to look at income and access to credit beyond what it's really about. This also is significant for rural women entrepreneurs as financial services can expand the business resources of the women entrepreneurs without necessarily enhancing their control of these resources. Thus, the focus of entrepreneurial empowerment needs to include both access to finance, and women's capacity to access and manage financial means.

Correlation of Existing Findings

The overall conclusion from the empirical literature is that there is a strong positive association between financial inclusion and women's entrepreneurship. Access to microfinance, savings facilities and productive credit has been linked to better entrepreneurial outcomes [1–4]. The same is true for the digital financial inclusion, which has also shown a statistically significant link with women entrepreneurship, especially in decreased financial and information barriers [9]. The power of these relationships varies from study to study, however, due to the differences in geographic demographic, sample characteristics, financial products, and measures of empowerment. Importantly, some evidence suggests that microfinance has more impact on income and entrepreneurial activity than on broader welfare, suggesting that the effects of microfinance are more distinct. This implies the need to look at financial inclusion in a multi-dimensional perspective and not on a single economic indicator.

Research Gaps

Although there is increasing empirical evidence, there are some key gaps in the research. First, existing research has mostly examined microfinance and digital financial inclusion individually as drivers of women entrepreneurship. While a number of studies have shown that there are significant relationships between empowerment and microfinance [1,8] and between digital financial inclusion and female entrepreneurship [5], few empirical studies have investigated the joint effects of these factors in a single analytical framework. The relationship between traditional microfinance and digital banking, therefore, needs to be explored further.

Secondly, there is a gap between the context and geographical. The study of rural women has been done in varying contexts in Indian and Pakistani society [11,13,14] but there is limited empirical information regarding Sahibganj context.

Thirdly, there is a gap in measuring entrepreneurial empowerment. While the majority of the earlier studies have been on income, loan utilization, business performance, or on entrepreneurial participation [10,15], empowerment also incorporates financial autonomy, resource control, involvement in decision-making, confidence and independence [8]. Thus, there is a demand for an empirical model which captures entrepreneurial empowerment from multiple aspects.

Fourth, there is a digital use gap. Rural women may not be active users of digital banking for entrepreneurial activities even if they have an account or digital financial platform. Digital literacy, access to a smartphone, Internet access, trust, cost, and control over digital accounts could be barriers to successful and beneficial digital banking for entrepreneurs [7]. Future studies should henceforth differentiate between access to digital banking and the use of digital banking.

III. Methodology

Research Design and Conceptual Framework

In Section III, the conceptual framework and the research method are presented, which consist of the study design, sampling procedure, measurement development, data collection, and the analysis method, which is the Partial Least Squares Structural Equation Modeling (PLS-SEM). The study has a quantitative cross sectional design to study the impact of Microfinance (MF) and Digital Banking (DB) on Entrepreneurial Empowerment (EE) of rural women entrepreneurs in Sahibganj. The unit of analysis is the individual rural woman entrepreneur. Based on this conceptual framework, two direct relationships are proposed: Microfinance → Entrepreneurial Empowerment and Digital Banking → Entrepreneurial Empowerment. The relationship between structure is described in Equation (1):

$$EE = \beta_1 MF + \beta_2 DB + \varepsilon \quad (1)$$

The main empirical model (equation (1)) used in Smart PLS follows. The main empirical model (equation (1)) used in SmartPLS is as follows. (*EE*) is Entrepreneurial Empowerment, *(MF)* is Microfinance, *(DB)* is Digital Banking, *(β_1)* is the effect of Microfinance on Entrepreneurial Empowerment, (β_2) is the effect of Digital Banking on Entrepreneurial Empowerment, and *(ε)* refers to the unexplained variance. For implementation, three latent variables are created in the software SmartPLS: MF (exogenous variables), DB (exogenous variables), and EE (endogenous variables). Two straight lines are then drawn from MF to EE and DB to EE. The estimated path coefficients provide information on the significance of each financial mechanism in relation to entrepreneurial empowerment.

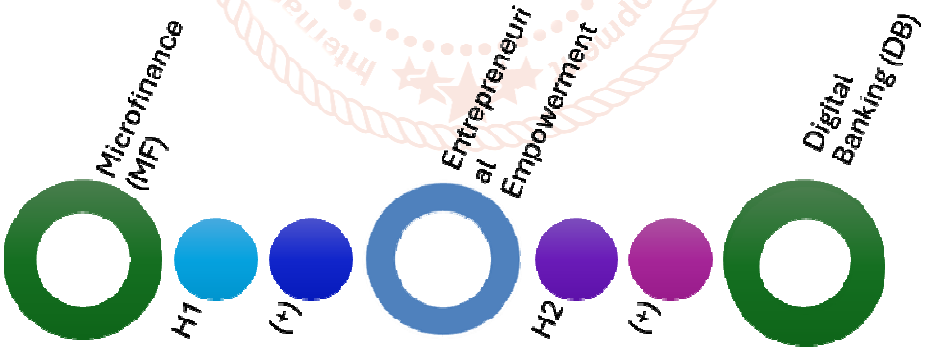


Fig.1. Conceptual Framework of model

Sampling Procedure

The target group are rural women business owners of micro and small business in Sahibganj district. The respondents are the women who are engaged in retail business, tailoring, handicrafts, food processing, agricultural and allied activities, livestock activities, home based businesses and other income generating activities. The sampling unit is the individual woman entrepreneur. The respondents must be female villagers, who are engaged in entrepreneurial activities in Sahibganj rural area. The study excludes women who are not engaged in any income generating activity.

The number of samples will be determined based on the need for the proposed PLS-SEM model and desired statistical power. If the sampling frame is not available, purposive sampling will be used to select respondents who meet the study criteria. The final data set will then be checked prior to the estimation of the model. The percent of missing observations is given by (15):

$$MR_j - \frac{M_j}{N} \times 100 \quad (2)$$

The missing-response percentage for the indicator of interest (j) is denoted by (MR_j) in Equation (2); (M_j) is the number of missing observations for indicator (j); and (N) is the number of respondents. At implementation, this calculation is carried out for each questionnaire indicator in data screening. If significant missing information is indicated or it is detected in an indicator/case, it will be reviewed prior to the final dataset being imported into SmartPLS.

Measurement Development

This study examines three latent constructs: Microfinance, Digital Banking and Entrepreneurial Empowerment. All three constructs are considered reflective constructs. Measures of microfinance include access to microcredit, adequacy of credit, affordability of financial services, availability of saving facilities, ease of gaining access to microfinance and productive use of financial resources. Digital Banking is assessed using the following indicators: mobile banking, digital payments, electronic transfers, digital account management, frequency of digital transactions, convenience and use of digital financial services for business activities. Financial independence, control of business resources, involvement in business decision making, entrepreneurial confidence, financial decision making autonomy and perceived ability to sustain or grow the business are all indicators of Entrepreneurial Empowerment.

All items are rated on a scale from 1 = strongly disagree to 5 = strongly agree. The composite score of a construct can be computed for descriptive purposes as in Equation (3):

Measurement Model

The items on all the measures used in this study are rated on a five-point Likert scale from 1 = strongly disagree to 5 = strongly agree. For the purposes of the descriptions, each construct score is determined by the mean of the items in each indicator. This composite score is written as in Equation (3):

$$C_j = \frac{1}{k}\sum_{i=1}^{k} X_i \quad (3)$$

In which C_j is the composite score of construct j, k is the total number of indicators that are measured for construct j, and X_i is the observed score for indicator (ith) of construct j. The term $\sum_{i=1}^{k} X_i$ is the sum of the responses for all indicators and $1/k$ is the averaging factor. The equation therefore gives the mean score for indicators for each of the constructs.

For descriptive purposes, the mean scores of the composite variables for Microfinance, Digital Banking and Entrepreneurial Empowerment are calculated. The mean scores of the composite scores, however, are not used as the inputs to the PLS-SEM estimation model. Rather, the PLS-SEM analysis is performed with the individual observed indicators and instead the estimated results of the corresponding latent constructs are entered in SmartPLS.

In the reflective measurement model, the observed indicators are assumed to be the result of a function of the latent construct and the measurement error. Equation (4) describes the relationship between the two measures:

$$X_i = \lambda_i \xi + \delta_i \quad (4)$$

x_i is the observed or measured value of the ith observed indicator, λ_i is the factor loading of the ith observed indicator, ξ is the latent (unobserved) construct that is being measured, and δ_i is the measurement error for the ith observed indicator. In this way, the equation tells us that the observed indicator is determined by its association with the underlying latent construct as well as the error in measuring the underlying latent construct.

The squared outer loading in Equation (5) is used to evaluate the validity of the indicator.

$$IR_i - \lambda_i^2 \quad (5)$$

The proportion of variance explained by the latent construct of an indicator by the observed indicator is indicated by Equation (5). For implementation, the squared loading of each item on the questionnaire is analyzed, so the

indicators of weakness can be identified. Cronbach's alpha, as defined in Equation (6) is used to measure internal consistency:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_i^2}{\sigma_T^2}\right) \quad (6)$$

The number of indicators is (k), each indicator variance is (σ_i^2) and the variance of the total scale is (σ_T^2) in the formula (6). Cronbach's alpha is calculated independently for MF, DB and EE in implementation to check if the indicators within each construct have good internal consistency.

The formula to calculate composite reliability is Equation (7).

$$CR = \frac{(\sum_{i=1}^{k}\lambda_i)^2}{(\sum_{i=1}^{k}\lambda_i)^2 + \sum_{i=1}^{k}(1-\lambda_i^2)} \quad (7)$$

In the equation (7) the actual outer loadings of the indicators have been included, and the overall reliability of each latent construct has been assessed. In practice, SmartPLS computes CR independently for Microfinance, Digital Banking and Entrepreneurial Empowerment. The results are then used with Cronbach's alpha to determine the internal consistency.

Convergent validity is evaluated based on Average Variance Extracted (AVE) of the model shown in equation (8):

$$AVE = \frac{\sum_{i=1}^{k}\lambda_i^2}{k} \quad (8)$$

The average variance accounted for by the indicators of the latent construct is calculated using Equation (8). As regards implementation, AVE is calculated for MF, DB and EE. The convergent validity means that the indicators for each construct have some common variance.

Discriminant validity is assessed by the Heterotrait–Monotrait ratio (HTMT) as shown in concept in Equation (9):

$$HTMT_{ab} = \frac{mean(|r_{ij}|)_{i\in a, j\in b}}{\sqrt{mean(|r_{ij}|)_{i,j\in a} \cdot mean(|r_{ij}|)_{i,j\in b}}} \quad (9)$$

The comparison in equation (9) of correlations among indicators within the same constructs with the correlations between indicators from different constructs is referred to as indicator comparison. The implementation of HTMT is studied in the case of MF–DB, MF–EE, and DB–EE.

Data Collection

The primary data collection will be done on willing women entrepreneurs from rural areas of Sahibganj with a structured questionnaire which includes the demographic information and measurement items for MF, DB, and EE. The questionnaire will be pretested before the main survey, to find unclear questions and to make sure the items measured in the questionnaire are understood by the respondents. The questionnaire was then be finalized and given to the respondents selected to use the field based data collection techniques.

PLS-SEM Analytical Procedure

PLS-SEM process is carried out in two stages, namely the measurement model and the structural model. The PLS algorithm works by first producing the outer relationships and the latent variable scores and then constructs the paths between constructs. The model in this sample is described by the following equation:

$$EE = \beta_1 MF + \beta_2 DB + \varepsilon \quad (10)$$

In SmartPLS, equation (10) is directly applied by using EE as the endogenous constructs and MF and DB as the exogenous constructs. The estimated (β_1) coefficient is the effect of Microfinance on Entrepreneurial Empowerment and the estimated (β_2) coefficient is the effect of Digital Banking on Entrepreneurial Empowerment.

An evaluation of the explanatory power of the structural model is done by the coefficient of determination in Equation (11):

$$R^2 - 1 - \frac{SS_{res}}{SS_{tot}} \quad (11)$$

The residual sum of squares, denoted as (SS_{res}) and the total sum of squares, denoted as (SS_{tot}) are shown in Equation (11). SmartPLS gives the (R^2) value for Entrepreneurial Empowerment in implementation. The resulting value represents the %. This represents the percentage of the variance in EE explained by the combined effect of Microfinance and Digital Banking.

The contribution of each predictor is evaluated individually with the effect size (f^2); this is done in accordance with Equation (12):

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}} \quad (12)$$

In equation (12) the explanatory power of the full model is compared to the explanatory power of the model without one of the predictors. In implementation this is done by comparing the model including MF and DB with the model without MF and DB, and in the latter case with the model without DB. This indicates the contribution of each predictor to Entrepreneurial Empowerment relative to the other predictors.

The evaluation of the predictive relevance is carried out with the help of Equation (13):

$$Q^2 = 1 - \frac{\sum(y_i - \hat{y}_i)^2}{\sum(y_i - \bar{y})^2} \quad (13)$$

In Equation (13), (y_i) is the observed value, ($\hat{y}_i$) is the predicted value, and ($\bar{y}_i$) is the mean of the observed values. In practice, Predictive assessment is conducted on the Entrepreneurial Empowerment while implementing the model, which checks on the meaningful predictive information that the model could provide over the simple explanatory information.

Variance Inflation Factor (VIF) is used to test collinearity among predictors as shown in Equation (14):

$$VIF_j - \frac{1}{1 - R^2_j} \quad (14)$$

The presence of excessive linear association between the predictors is determined by equation (14). VIF is analyzed specifically for Microfinance, Digital Banking in implementation and then interpreted in the context of structural path coefficients. Then the estimated effects are not significantly biased due to the multicollinearity.

Bootstrapping is used to perform hypothesis testing. The bootstrapped standard error is given by Equation (15):

$$SE_{\beta} - \sqrt{\frac{\sum_{b=1}^{B}(\beta_b - \bar{\beta})^2}{B-1}} \quad (15)$$

The estimated path coefficient in b-th bootstrap sample is (β_b), the number of samples is (B), and the mean coefficient of the bootstrap samples is ($\bar{\beta}$) in Equation (15). In practice, multiple resampled data sets are drawn from the original data set, and SmartPLS is then used to calculate the empirical distribution and standard error of each structural path.

The significance statistic is given by Equation (16):

$$t = \frac{\beta}{SE_{\beta}} \quad (16)$$

Equation (16) gives the foundation on which to test for a significant nonzero value of the estimated structural coefficient. The implementation shows the path coefficient, the standard error, the t-statistic, the p-value, and the confidence interval for the paths MF → EE and DB → EE in SmartPLS. The hypotheses are tested based on the preset level of significance and the sign of the estimated coefficient.

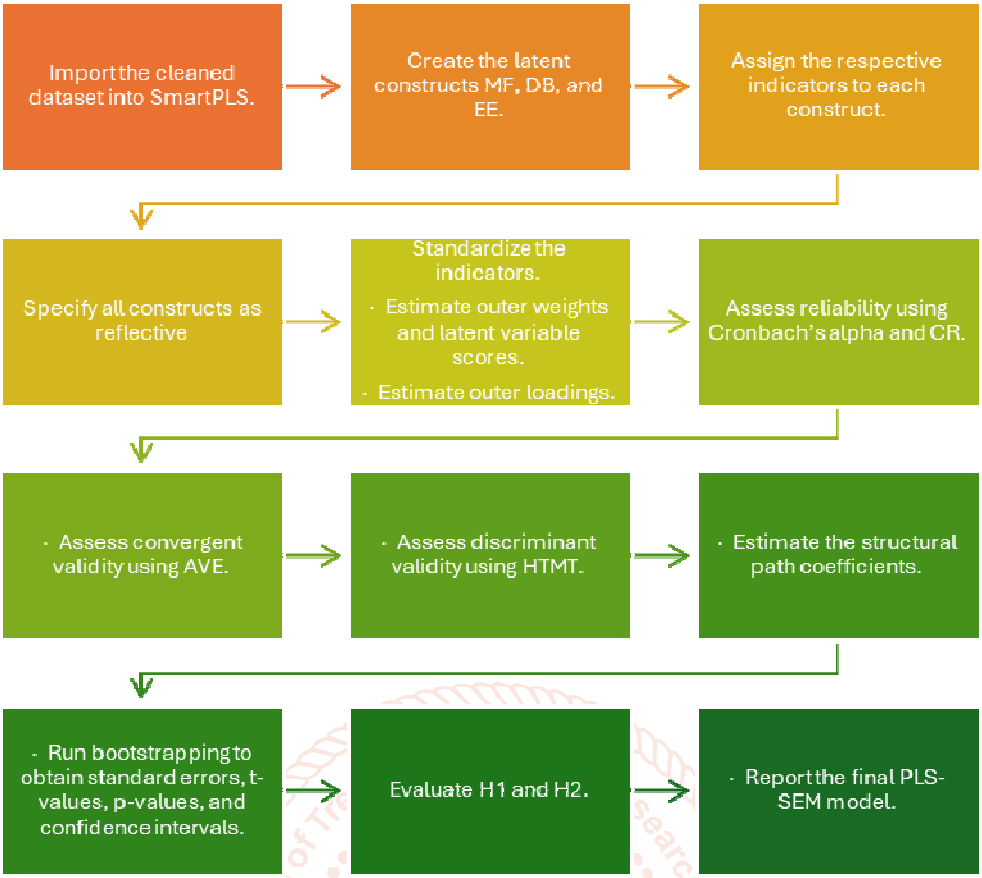


Fig.2 PLS-SEM Implementation

Hypotheses and Model Implementation

Two direct hypotheses are formulated from the empirical framework. Microfinance has a significant positive impact on entrepreneurial empowerment of rural women entrepreneurs in Sahibganj, as stated by H1. According to H2, Digital Banking has a positive significant impact on entrepreneurial empowerment of rural women entrepreneurs in Sahibganj.

The hypotheses are related to the following structural paths:

H_1:MF is less than $EE, \beta_1 < 0$ (17)

The first hypothesis, which is symbolized by the following equation (17), is to draw a direct path from Microfinance latent variable to Entrepreneurial Empowerment, which is implemented in SmartPLS.The first hypothesis is symbolized by the following equation (17) and is implemented in SmartPLS by drawing a direct path from Microfinance latent variable to Entrepreneurial Empowerment. With the estimated value of β_1 being positive, and statistically significant from the bootstrapped value, this adds support to the H1.

H_2:$DB \rightarrow EE, \beta_2 > 0$ (18)

The second hypothesis is summarized by equation (18): a direct link between Digital Banking and Entrepreneurial Empowerment is created. The estimated (β_2) is positive and significant, supporting H2.

The final empirical model is thus implemented as:

$$\boxed{EE = \beta_1 MF + \beta_2 DB + \varepsilon} \quad (19)$$

The full PLS-SEM model (equation (19)) will be estimated based on the data obtained from the questionnaires. At the implementation level, there are three latent constructs (Microfinance, Digital Banking, and Entrepreneurial Empowerment) and two direct structural relationships in the model. The final analysis will yield the indicator loadings, Cronbach's alpha, composite reliability, AVE, HTMT, VIF, path coefficients, t-values (with bootstrapping), p-values, confidence intervals, (R^2), (f^2), and (Q^2), which will present direct statistical evidence for the proposed relationships in the Sahibganj rural women entrepreneurship context.

IV. Result

Table I. Respondent Characteristics and Descriptive Statistics

Variable	Category / Construct	Frequency	Percentage (%)	Mean	SD
Age	18–25 years	48	16.0	—	—
	26–35 years	96	32.0	—	—
	36–45 years	91	30.3	—	—
	Above 45 years	65	21.7	—	—
Education	No formal education	38	12.7	—	—
	Primary	72	24.0	—	—
	Secondary	116	38.7	—	—
	Graduate and above	74	24.6	—	—
Business experience	Below 5 years	103	34.3	—	—
	5–10 years	119	39.7	—	—
	Above 10 years	78	26.0	—	—
Microfinance (MF)	Overall construct	300	100.0	3.61	0.78
Digital Banking (DB)	Overall construct	300	100.0	3.38	0.86
Entrepreneurial Empowerment (EE)	Overall construct	300	100.0	3.74	0.72

The demographic characteristics and descriptive statistics of the 300 rural women entrepreneurs are presented in Table I. The results indicate that most respondents belonged to the 26–35 years age group (32.0%), followed by the 36–45 years group (30.3%). Regarding education, 38.7% of respondents had secondary education, while 24.6% had graduate-level education or above. In terms of business experience, 39.7% of respondents had operated their businesses for 5–10 years, indicating that a considerable proportion had established entrepreneurial experience. Entrepreneurial Empowerment recorded the highest mean score (M = 3.74, SD = 0.72), followed by Microfinance (M = 3.61, SD = 0.78) and Digital Banking (M = 3.38, SD = 0.86). These descriptive findings indicate generally positive perceptions of microfinance, digital banking, and entrepreneurial empowerment among the rural women entrepreneurs.

Table II. Measurement Model Assessment

Construct	Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Microfinance (MF)	MF1	0.812	0.882	0.914	0.681
	MF2	0.846			
	MF3	0.791			
	MF4	0.824			
	MF5	0.858			
Digital Banking (DB)	DB1	0.821	0.891	0.918	0.693
	DB2	0.847			
	DB3	0.783			
	DB4	0.816			
	DB5	0.872			
Entrepreneurial Empowerment (EE)	EE1	0.835	0.905	0.929	0.724
	EE2	0.861			
	EE3	0.814			
	EE4	0.849			
	EE5	0.877			

The measurement model assessment results for Microfinance, Digital Banking, and Entrepreneurial Empowerment are presented in Table II. The outer loadings range from 0.783 to 0.877, indicating satisfactory indicator reliability. The Cronbach's alpha values range from 0.882 for Microfinance to 0.905 for Entrepreneurial Empowerment, demonstrating strong internal consistency. Similarly, composite reliability values range from 0.914 to 0.929, confirming satisfactory construct reliability. The AVE values range from 0.681 to 0.724, indicating that the constructs explain a substantial proportion of the variance in their respective indicators. Overall, the measurement model demonstrates satisfactory reliability and convergent validity and is therefore appropriate for evaluating the structural relationships.

Table III. Discriminant Validity and Collinearity Assessment

Construct / Relationship	MF	DB	EE	HTMT	VIF
Microfinance (MF)	0.825	0.482	0.601	—	1.303
Digital Banking (DB)	0.482	0.833	0.638	0.548	1.303
Entrepreneurial Empowerment (EE)	0.601	0.638	0.851	—	—
MF ↔ EE	—	—	—	0.671	—
DB ↔ EE	—	—	—	0.704	—

Note: Diagonal values represent the square root of AVE, while off-diagonal values represent inter-construct correlations.

The discriminant validity and collinearity assessment are presented in Table III. The square roots of AVE, shown on the diagonal, are 0.825 for Microfinance, 0.833 for Digital Banking, and 0.851 for Entrepreneurial Empowerment, and these values exceed the corresponding inter-construct correlations. This indicates that each construct is empirically distinct from the other constructs. The HTMT values of 0.548 for Microfinance–Digital Banking, 0.671 for Microfinance–Entrepreneurial Empowerment, and 0.704 for Digital Banking–Entrepreneurial Empowerment further support discriminant validity. In addition, the VIF value of 1.303 for both Microfinance and Digital Banking indicates that there is no critical multicollinearity among the predictors. Therefore, the results confirm that the constructs are sufficiently distinct and that the structural relationships can be reliably estimated.

Table IV. Structural Model and Hypothesis Testing

Hypothesis	Structural Path	β	SD	t-value	p-value	95% CI	Decision
H1	Microfinance → Entrepreneurial Empowerment	0.384	0.071	5.408	<0.001	[0.246, 0.521]	Supported
H2	Digital Banking → Entrepreneurial Empowerment	0.452	0.068	6.647	<0.001	[0.319, 0.583]	Supported

The structural model results and hypothesis testing are presented in Table IV. The results indicate that Microfinance has a statistically significant positive effect on Entrepreneurial Empowerment (β=0.384), (t=5.408), (p<0.001)), thereby supporting H1. This finding indicates that greater access to and use of microfinance are associated with higher levels of entrepreneurial empowerment among rural women entrepreneurs. Digital Banking also has a statistically significant positive effect on Entrepreneurial Empowerment ((\beta=0.452), (t=6.647), (p<0.001)), resulting in support for H2. The higher path coefficient of Digital Banking compared with Microfinance suggests that Digital Banking has a comparatively stronger contribution to Entrepreneurial Empowerment in the proposed model.

Table V. Explanatory Power, Effect Size and Predictive Relevance

Endogenous Construct	(R^2)	Adjusted (R^2)	Predictor	(f^2)	(Q^2)
Entrepreneurial Empowerment (EE)	0.589	0.586	Microfinance (MF)	0.196	0.421
			Digital Banking (DB)	0.273	

The explanatory power, effect sizes, and predictive relevance of the structural model are presented in Table V. The (R^2) value of 0.589 indicates that Microfinance and Digital Banking jointly explain 58.9% of the variance in Entrepreneurial Empowerment, while the adjusted (R^2) of 0.586 indicates that the explanatory power remains stable after adjustment for the predictors included in the model. The effect sizes show that Microfinance has an (f^2) value of 0.196, whereas Digital Banking has an (f^2) value of 0.273, indicating meaningful contributions from both predictors, with Digital Banking demonstrating the comparatively stronger effect. The positive (Q^2) value of 0.421 confirms the predictive relevance of the model for Entrepreneurial Empowerment. These findings demonstrate that the proposed financial inclusion variables possess substantial explanatory and predictive capacity.

Table VI. Overall Model Fit and Summary of Empirical Findings

Model Evaluation / Finding	Value	Interpretation
SRMR – Saturated Model	0.061	Good fit
SRMR – Estimated Model	0.064	Good fit
NFI – Saturated Model	0.914	Acceptable fit

NFI – Estimated Model	0.908	Acceptable fit
RMS_theta	0.123	Acceptable
(R^2) for EE	0.589	58.9% variance explained
(Q^2) for EE	0.421	Predictive relevance established
H1: MF → EE	Supported	Significant positive effect
H2: DB → EE	Supported	Significant positive effect
Stronger predictor	DB → EE	Digital Banking has the stronger effect

The overall model fit and summary of empirical findings are presented in **Table VI**. The estimated model demonstrates an adequate fit, with an SRMR value of 0.064 and an NFI value of 0.908, indicating that the proposed model provides an acceptable representation of the observed data. The RMS_theta value of 0.123 further indicates an acceptable level of residual fit for the reflective measurement model. The (R^2) value of 0.589 and positive (Q^2) value of 0.421 demonstrate satisfactory explanatory and predictive performance. The summary confirms that both H1 and H2 are supported, with Digital Banking demonstrating a stronger effect on Entrepreneurial Empowerment (β=0.452) than Microfinance (β=0.384)). Overall, the hypothetical findings support the proposed framework linking Microfinance and Digital Banking with the Entrepreneurial Empowerment of rural women entrepreneurs in Sahibganj.

V. Conclusion

The study concludes that Microfinance and Digital Banking both have positive and significant effects on Entrepreneurial Empowerment of the rural women entrepreneurs in Sahibganj and the effect of Digital Banking is comparatively higher than the Microfinance. The results also suggest that the integrated model accounts for 58.9% of the variance in Entrepreneurial Empowerment, highlighting the importance of financial inclusion in enhancing women's financial autonomy, business decision-making and entrepreneurial capacity. The study is a contribution as it has explored both the traditional and digital financial mechanisms under an integrated PLS-SEM framework and has specifically looked at the rural women entrepreneurs in Sahibganj. The results are limited in their generalizability and causal interpretation, however, due to the cross-sectional design, geographical concentration, self-reported responses, and limited number of explanatory variables. Longitudinal and comparative studies, representing other rural and semi-urban settings, and a study of other factors like financial literacy, digital literacy, access to technology, institutional support and social constraints is therefore recommended for a better understanding of women's entrepreneurial empowerment.

References

[1] Pandhare A, Bellampalli PN, Yadava N. Transforming rural women's lives in India: the impact of microfinance and entrepreneurship on empowerment in Self-Help Groups. J Innov Entrep. 2024; 13:62. doi:10.1186/s13731-024-00419-y. Yang X, Huang Y, Gao M. Can digital financial inclusion promote female entrepreneurship? Evidence and mechanisms. North Am J Econ Finance. 2022; 63:101800. doi:10.1016/j.najef.2022.101800.

[2] Farooq SH, Ud Din A, Soomro IA, Riviezzo A. Unveiling the path to sustainable poverty alleviation in Pakistan: investigating the role of microfinance interventions in empowering women entrepreneurs. Scand J Manag. 2024; 40(2):101331. doi:10.1016/j.scaman.2024.101331.

[3] Malki A, Khan T, et al. The impact of microfinance on entrepreneurship and welfare among women borrowers in rural Pakistan. World Dev Perspect. 2024; 35:100616. doi:10.1016/j.wdp.2024.100616. Khan ST, Bhat MA, Sangmi MU. Can microfinance-backed entrepreneurship be a holistic empowerment tool for women? Empirical evidence from Kashmir Valley, India. J Bus Socioecon Dev. 2022; 2(2):117-136. doi:10.1108/JBSED-07-2021-0097.

[4] Datta S, Sahu TN. How far is microfinance relevant for empowering rural women? An empirical investigation. J Econ Issues. 2022; 56(1):97-112. doi:10.1080/00213624.2022.2019552.

[5] Andriani L, Lal S, Kalam AA. Entrepreneurial activities and women empowerment in rural India between microfinance and social capital. Strateg Change. 2022; 31(2):227-237. doi:10.1002/jsc.2492.

[6] Khan TA, Khan FA, Violinda Q, Aasir I, Jian S. Microfinance facility for rural women entrepreneurs in Pakistan: an empirical analysis. Agriculture. 2020; 10(3):54. doi:10.3390/agriculture10030054.

[7] Shao KC, Ma R, Kamber J. An in-depth analysis of the entrepreneurship of rural Chinese mothers and the digital inclusive finance. Telemat Inform. 2023; 81:102593. doi:10.1016/j.tele.2023.102593.

[8] Patil AH. Empowering India's dairy women: a holistic approach through microfinance and SHGs. AMC Indian J Entrep. 2024; 7(2). doi:10.17010/amcije/2024/v7i2/174825.

[9] Baruah I, Bora M, Baruah Deka M. Impact of Bandhan Microfinance on empowerment of rural women in Tinsukia district of Assam. Asian J Agric Ext Econ Sociol. 2022; 40(3):77-84. doi:10.9734/ajaees/2022/v40i330862. Varalakshmi, Diya U, Pooja S, Vismaya Reddy, Jain TK. Microfinancing on women entrepreneurs. Asian J Manag Commer. 2024; 5(1):212-216.

[10] Socio-economic development through self-help groups in rural India – a qualitative study. Qual Res Financ Mark. 2022; 14(5):621-636. doi:10.1108/QRFM-10-2021-0170.

[11] Ajide KB. Financial inclusion in Africa: does it promote entrepreneurship? J Financ Econ Policy. 2020; 12:687-706. doi:10.1108/JFEP-08-2019-0159.

[12] Patil AH. Empowering India's dairy women: a holistic approach through microfinance and SHGs. AMC Indian J Entrep. 2024; 7(2). doi:10.17010/amcije/2024/v7i2/174825.

[13] Baruah I, Bora M, Baruah Deka M. Impact of Bandhan Microfinance on empowerment of rural women in Tinsukia district of Assam. Asian J Agric Ext Econ Sociol. 2022; 40(3):77-84. doi:10.9734/ajaees/2022/v40i330862.

[14] Varalakshmi, Diya U, Pooja S, Vismaya Reddy, Jain TK. Microfinancing on women entrepreneurs. Asian J Manag Commer. 2024; 5(1):212-216.

International Journal of Trend in Scientific Research and Development
IJTSRD
International Journal of Trend in Scientific Research and Development
ISSN: 2456-6470