



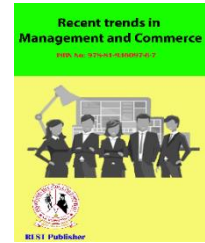
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Bridging the Financial Divide: Promoting Microfinance and Financial Inclusion through the Weighted Product Methodology in Developing Countries

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Abstract: Financial inclusion is crucial for poverty alleviation and sustainable development, especially in developing countries like India. Despite advances in mobile and digital banking, many people remain excluded from formal financial systems. This paper uses the MCDM technique, Weighted Product Methodology (WPM), to evaluate microfinance strategies using indicators such as credit linkage and cost efficiency. It explores how expanding telecommunications infrastructure and fin tech integration can support inclusion, and address challenges such as digital illiteracy, gender gaps, and cybersecurity. This research addresses financial exclusion through an integrated analysis of telecommunications infrastructure, microfinance institutions (MFIs) and a multi-criteria decision-making tool called the Weighted Product Methodology. By assessing indicators such as loan disbursement, default rates and outreach, it provides insights into MFI performance. Using data from Global Findex, MIX and NSS, along with geospatial data, the study provides a nuanced view of inclusion at the micro level. It also highlights risks such as fraud and digital illiteracy, emphasizing the need for inclusive, user-centric FinTech policies and data-driven resource allocation. Alternatives taken as Global Findex Database, Microfinance Information Exchange, IMF Financial Access Survey, National Sample Survey, similar MFI-level data. Evaluation Parameters taken as Loan Disbursement Rate (%), Client Outreach (thousands), Loan Default Rate (%), Operational Costs (% of budget). The results show that National Sample Survey received the highest ranking, whereas Microfinance Information Exchanger received the lowest ranking. According to the WPM method, National Sample Survey ranks highest in terms of its value for Financial Inclusion and Microfinance applications.

Key words: Financial inclusion, microfinance, telecommunications infrastructure, weighted production method (WPM), digital literacy, economics Empowerment.

1. INTRODUCTION

Telecommunications infrastructure plays a key role in the development trajectory of individuals, especially in countries like India, by improving connectivity and creating new opportunities. However, for this development to be truly effective, it must be supported by inclusive policy frameworks. These policies must go beyond simply expanding telecommunications access and promote the integrated use of information technology, taking into account the diverse socio-economic backgrounds of people. It is crucial to align these technological advances with the needs of microfinance and financial services targeted at low-income and marginalized communities. In doing so, telecommunications and information technology strategies can help bridge the digital divide and serve as tools for economic empowerment rather than sources of inequality. To support this vision, our research frames financial inclusion within a structured analytical model. We outline our data collection strategies, sampling processes, and econometric tools to ensure transparency in our approach. The empirical section uses this framework to analyze financial inclusion dynamics, with a view to identifying key trends and relationships. The final section synthesizes the findings and translates them into practical policy recommendations for microfinance practitioners and policymakers, fostering informed and inclusive financial development. In the next step of our analysis, we will delve deeper into the role of rural banks (RBs), even in areas where they already exist. We propose that establishing new microfinance bank

(MFB) branches can increase financial inclusion, especially in the early years. Evidence suggests that new MFB branches stimulate local financial activity and improve access. To analyze this, we use detailed geo-matching, aligning household and branch-level data for accuracy. By combining geographic coordinates, we can use night-time satellite imagery to assess the impact of MFBs at the micro-scale, observing local economic changes. Meanwhile, the rise in mobile phone usage explains the growing dependence on digital devices. However, this technological shift also raises concerns about mental health issues such as anxiety and insomnia, which is fueling debates about responsible digital use. Excessive use in the workplace has raised warnings about reduced productivity, leading organizations to reevaluate digital practices. In addition, people with low literacy rates face increased risks of online fraud and malware due to limited digital literacy, which emphasizes the importance of awareness programs on cyber security. Informal savings arrangements, while widespread, are often unsecured and provide low returns due to a lack of regulation. In financial emergencies, individuals may turn to unregulated lenders with high interest rates, increasing the risk of default. The lack of diverse credit products and limited investment opportunities constrain economic mobility, especially for small entrepreneurs. These include the lack of adequate remittance services and the lack of insurance products, both of which reduce financial resilience and increase vulnerability to shocks. To address these issues, initiatives aimed at mobilizing rural savings have emerged. By offering commercial interest rates and promoting unit trusts, they reduce dependence on government support. Early challenges include unclear definitions of collateral, often relying on informal documents. However, flexible lending policies have allowed loan officers to build borrower relationships, scale loans based on repayment history, and foster trust and financial inclusion. Gender disparities in financial access are another significant barrier. Low literacy rates among women often prevent them from engaging in formal financial systems. Even when women have bank accounts, fear of fraud prevents them from using digital services such as ATMs or mobile banking. Promoting financial literacy, especially among women, and introducing secure technologies can help overcome these barriers and support greater inclusion and economic empowerment. Despite its potential, microfinance has failed to fully integrate with other sectors, limiting innovation and long-term impact. The prevailing model emphasizes rapid growth and individual success, echoing subprime lending practices rather than fostering collective well-being. Critics argue that its adoption is driven by compliance with neoliberal policies, rather than effectiveness in poverty reduction. To truly benefit communities, microfinance must shift towards models grounded in local ownership, collaboration, and integration with broader development systems. This approach promises more equitable, sustainable outcomes than the current framework and addresses structural poverty more effectively.

2. MATERIALS AND METHOD

Alternatives:

Global Findex Database: The World Bank created the Global Findex database, which provides comprehensive information on how adults around the world manage risk, save, borrow, and payovers financial inclusion indicators across over 140 countries, collected every three years through surveys. The data includes variables such as account ownership, digital payments, and access to credit, enabling policymakers and researchers to monitor progress and design interventions to expand financial access globally.

Microfinance Information Exchange (MIX): The Microfinance Information Exchange is one of the world's best sources of information on the financial and social performance of microfinance institutions. It offers data on outreach, portfolio quality, sustainability, and transparency. MIX helps stakeholders compare performance across regions and institution types. By standardizing financial data, it supports better decision-making by donors, investors, and regulators while promoting accountability and efficiency in the microfinance sector through benchmarking and analytics.

IMF Financial Access Survey (FAS): The IMF's Financial Access Survey (FAS) is a unique database that provides annual statistics on financial access in more than 180 countries. It tracks metrics such as the number of ATMs, commercial bank branches, depositors, and borrowers per 1,000 adults. It helps assess financial inclusion infrastructure and identify access gaps. The FAS supports international efforts to measure financial development and guides policy strategies for expanding inclusive financial services.

National Sample Survey (NSS): The National Sample Survey (NSS) is conducted by the National Sample Survey Office of India, gathers socio-economic data from households across the country. It includes modules on household income, expenditure, debt, and financial access. NSS data aids in evaluating microfinance impact, rural credit availability, and financial behavior patterns. Policymakers use these insights to shape inclusive financial policies and programs, particularly in underserved rural and low-income urban communities.

MFI-level Datasets: Microfinance Institution (MFI)-level datasets, such as those from Grameen Bank or SKS Microfinance, contain detailed operational data. These include metrics on loan disbursement, repayment rates, borrower demographics, and outreach. Such datasets allow deep analysis of microfinance performance at the institutional level. Researchers and development agencies utilize this information to evaluate the sustainability, impact, and efficiency of MFIs in promoting financial inclusion and reducing poverty among marginalized populations.

Evaluation parameter:

Loan Disbursement Rate (%): The Loan Disbursement Rate refers to the proportion of approved loan amounts that are actually disbursed to borrowers. It is a key indicator of a financial institution's efficiency in converting loan approvals into real lending. A higher disbursement rate signifies strong operational capacity and demand, while a low rate may indicate procedural delays, lack of borrower readiness, or internal inefficiencies within the lending process.

Client Outreach (thousands): Client Outreach measures the number of individuals or clients served by a financial institution, typically expressed in thousands. It reflects the institution's reach and inclusiveness, particularly in microfinance or development finance. High outreach means the organization effectively extends services to a broad population, supporting financial inclusion. It is also used to assess growth, impact, and the ability to meet the needs of underserved or remote communities.

Loan Default Rate (%): The Loan Default Rate indicates the percentage of loans that borrowers fail to repay as scheduled. It serves as a critical measure of credit risk and financial stability. A high default rate suggests poor borrower screening, weak repayment capacity, or economic challenges. Conversely, a low default rate reflects strong credit practices and borrower reliability. Monitoring this metric helps institution manage risk and maintain portfolio health.

Operational Costs (% of budget): Operational Costs represent the percentage of an organization's total budget spent on everyday functioning, including staff salaries, utilities, and administration. This metric evaluates cost efficiency and resource management. Lower operational costs indicate lean operations and better cost control, while higher costs may require assessment of spending efficiency. For financial institutions, controlling operational costs is essential to maintaining profitability and ensuring funds are directed toward client services.

Method: WPM provides a more robust approach to penalizing low-priority alternatives and is computationally more efficient than the TOPSIS method. It is dimensionless, and unlike TOPSIS, it avoids ranking conflicts. The priority index for each alternative is independent of the others, helping to establish a threshold to minimize unnecessary trade-offs. Therefore, we suggest that WPM is a better choice Compared to TOPSIS in dynamic decision-making situations. The proposed method is built on the WPM approach, where the weight assignment process is guided by a sensitivity analysis of the most important criteria. [22] However, the transcription-based method of measuring WPM has several drawbacks. The length of words can vary, and their pronunciation can vary significantly due to various speech-related factors such as phonetic stress, frequency, contextual predictability, and repetition. [23] A more reliable method for penalizing less significant options is the Weighted Product Method and is computationally more efficient than the TOPSIS method. Being dimensionless, it avoids problems related to ranking conflicts. In addition, the priority index for each alternative operates independently, helping to establish thresholds to minimize unnecessary acquisitions. Therefore, we recommend WPM as a more effective choice for dynamic decision-making situations. [24] An enhanced average DBI of 1.052 is obtained by using WPM+K-Averages. Furthermore, while employing WPM+K means, K-Average iterations decrease from nine to four on average. Higher DBI values are shown in the study's conclusions, whereas lower DBI scores indicate better K-means algorithm performance. These results also show that K-means clustering improves WPM cluster evaluation measures. Additionally, it is anticipated that fewer K-means iterations will result in a shorter calculation time. [25] WPM offers Data multiplexing in both the time and frequency domains is made possible by the WPM method's provision of time and frequency resolution within the transmission packets. Data in TDM and OFDM packets will be damaged when tone and imuse interfaces are merged into a transmission packet. Even in cases of extreme interference, transmission performance can be preserved by splitting these interferences into WPM packets. This study suggests a multimode transmission technique that combines OFDM with WPM, allowing for effective data transfer in settings like WLAN systems that are impacted by multipath effects, tone, and imuse interfaces. With this approach, WPM packets are used in high interference environments, while OFDM packets are used under multipath fading conditions. [26] To our knowledge, 13 WPM is considered a fast rate for text input using a joystick. Although it was possible to use two sticks simultaneously, participants typically used only one. Therefore, it is appropriate to compare our data with other studies that used a single stick. [27] We present a chord-based text in this work input method designed for a 3x4 button keyboard that enables expert people to reach a 60 words per minute (WPM) average typing pace during character-by-character input. Our findings demonstrate that

beginners using the chord method can achieve speeds of 400 WPM after 26 minutes of training and can match their multi-tap typing speed in just 80 training minutes. In addition, we explore the potential for integrating this chord method into mobile phone designs. [28] In contrast, Research on head-based methods is relatively limited input. Some users were asked to indicate keys on an electronic keyboard using either vision Using either vision or head movements, users selected keys and confirmed their selection using the spacebar. Typing speeds were found to reach 4.42 WPM and 10.98 WPM using vision-based input with head movements. We believe that head typing input is a preferred approach due to this unique feature. [29] In the WPM method, weighted normalized criterion values are used. However, instead of multiplying the normalized criterion values, each normalized criterion value the priority assigned to the relevant criterion is elevated to the weight's power. [30] We introduce a chord-based text input method this helps expert users achieve average typing speed of 60 words per minute (wpm) during character-by-character input on a 3x4 button keyboard. Our results show that beginners can reach over 400 words per minute after 26 minutes of training and can match their many plates typing speed Within 80 minutes training. In addition, we explore the feasibility of incorporating this chord typing technique into mobile phone designs. [31] A considerable amount of research has been devoted to vision typing, with many techniques relying on location-based input, where a user chooses a character by spending a specific amount of time concentrating on it of time. Most methods use a fixed location time of 450ms to 1000ms, which results in text input speeds of 5 to 10 WPM. An experiment was conducted to determine the minimum acceptable location time by gradually reducing it The mean location time dropped from 876 to 282 minutes throughout ten 15-minute sessions, and the text input speed was raised from 6.9 WPM to 19.9 WPM in order to enhance performance [32].

3. ANALYSIS AND DISCUSSION

TABLE 1. Financial Inclusion and Microfinance

	Loan Disbursement Rate (%)	Client Outreach (thousands)	Loan Default Rate (%)	Operational Costs (% of budget)
Global Findex Database	66.0000	867.0000	96.0000	32.0500
Microfinance Information Exchange	58.0000	963.0000	43.6900	85.0000
IMF Financial Access Survey	78.0000	852.0000	39.1800	86.0000
National Sample Survey	59.0000	741.0000	26.6000	39.0000
Similar MFI-level data	37.0000	951.0000	37.9600	28.9000

Table 1 presents a comparative analysis of key indicators related to financial inclusion and microfinance performance across five prominent data sources. The Global Findex Database reports a high loan disbursement rate of 66% and the highest loan default rate (96%), indicating strong outreach (867,000 clients) but potentially lax credit control. In contrast, the Microfinance Information Exchange (MIX) shows slightly lower disbursement (58%) but higher outreach (963,000), with a significantly lower default rate (43.69%) and high operational costs (85%). The IMF Financial Access Survey records the highest disbursement rate (78%) and moderate default rate (39.18%), but also the highest operational cost (86%). The National Sample Survey (NSS) reveals balanced figures, with moderate disbursement (59%), the lowest default rate (26.6%), and relatively low costs (39%). Lastly, similar MFI-level data reports the lowest disbursement (37%) but high outreach (951,000) and the lowest operational costs (28.9%).

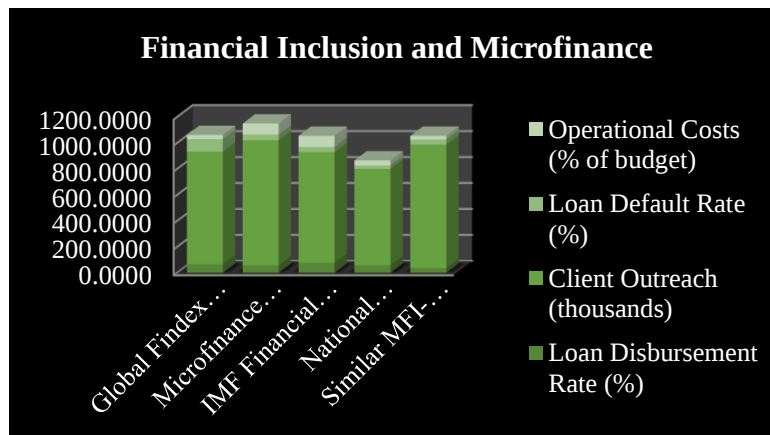


FIGURE 1. Financial Inclusion and Microfinance

Figure 1 presents a comparative overview of financial inclusion indicators across five prominent data sources. The IMF Financial Access Survey reports the highest loan disbursement rate at 78%, indicating a strong outreach capacity, followed by the Global Findex Database at 66%. Interestingly, despite the Microfinance Information Exchange (MIX) showing the highest client outreach (963,000), it also records a high operational cost (85%) and a moderately high default rate (43.69%), suggesting inefficiencies in cost management. The National Sample Survey reflects more balanced performance, with moderate disbursement (59%), low default rate (26.6%), and manageable operational costs (39%). Meanwhile, MFI-level data show the lowest disbursement rate (37%) despite high outreach, coupled with relatively lower costs (28.9%) and default rate (37.96%).

TABLE 2. Performance value

	Performance value			
	Loan Disbursement Rate (%)	Client Outreach (thousands)	Loan Default Rate (%)	Operational Costs (% of budget)
Global Findex Database	264.00000	0.90031	0.27708	0.90172
Microfinance Information Exchange	232.00000	1.00000	0.60883	0.34000
IMF Financial Access Survey	312.00000	0.88474	0.67892	0.33605
National Sample Survey	236.00000	0.76947	1.00000	0.74103
Similar MFI-level data	148.00000	0.98754	0.70074	1.00000

Table 2 illustrates normalized performance values across four key indicators to assess microfinance effectiveness. The IMF Financial Access Survey exhibits the highest loan disbursement value (312.00), highlighting its superior outreach in credit delivery. However, its relatively lower scores in client outreach (0.88474) and operational efficiency (0.33605) indicate a potential imbalance between loan issuance and sustainability. The Microfinance Information Exchange shows the highest outreach score (1.00000), demonstrating broad service coverage, though at a cost—its operational efficiency (0.34000) and loan default performance (0.60883) remain suboptimal. The National Sample Survey performs best in minimizing loan defaults (1.00000), implying strong repayment structures, but with lower outreach (0.76947). MFI-level data demonstrate strong cost efficiency (1.00000) and solid performance in default rates (0.70074), yet the lowest disbursement value (148.00).

TABLE 3. Weight

	Weight			
	0.25	0.25	0.25	0.25
Global Findex Database	0.25	0.25	0.25	0.25
Microfinance Information Exchange	0.25	0.25	0.25	0.25
IMF Financial Access Survey	0.25	0.25	0.25	0.25
National Sample Survey	0.25	0.25	0.25	0.25
Similar MFI-level data	0.25	0.25	0.25	0.25

Table 3 presents the equal weighting assigned to each performance criterion—Loan Disbursement Rate, Client Outreach, Loan Default Rate, and Operational Costs—for all five data sources. Each criterion carries a weight of 0.25, reflecting a balanced evaluation approach in the Weighted Product Method (WPM) analysis. This uniform weighting ensures that no single indicator disproportionately influences the outcome, thus promoting a fair assessment of microfinance institutions (MFIs) across multiple performance dimensions. The approach is particularly valuable in policy and operational analysis, as it emphasizes the need for equilibrium between outreach, financial sustainability, efficiency, and risk. Equal weighting implies that expanding access (outreach), minimizing loan defaults (risk), enhancing disbursement efficiency, and controlling operational costs are all equally critical for successful financial inclusion. This design choice underscores the study's objective to offer an unbiased and comprehensive performance evaluation, essential for identifying optimal strategies to enhance microfinance effectiveness and financial inclusion outcomes in underserved populations.

TABLE 4. Weighted normalized decision matrix

	Weighted normalized decision matrix			
	4.03089	0.97409	0.72553	0.97447
Global Findex Database	4.03089	0.97409	0.72553	0.97447
Microfinance Information Exchange	3.90276	1.00000	0.88333	0.76361
IMF Financial Access Survey	4.20280	0.96985	0.90773	0.76138
National Sample Survey	3.91948	0.93659	1.00000	0.92781
Similar MFI-level data	3.48791	0.99687	0.91493	1.00000

Table 4 presents the Weighted Normalized Decision Matrix, a core component of the Weighted Product Method (WPM), which adjusts each performance value by its respective weight to allow for comparative ranking. Here, the decision matrix reflects the composite performance of each data source—Global Findex, MIX, IMF, NSS, and Similar MFI-level data—across four key indicators: Loan Disbursement Rate, Client Outreach, Loan Default Rate, and Operational Costs. The IMF Financial Access Survey exhibits the highest score for Loan Disbursement (4.20280), while Similar MFI-level data scores highest in Operational Costs (1.00000), indicating efficiency. The National Sample Survey leads in minimizing Loan Default Rate (1.00000), demonstrating strong risk management. This matrix highlights the trade-offs between dimensions. For instance, while MIX leads in Client Outreach (1.00000), it lags in cost-efficiency. Such insights are critical for policymakers and institutions to prioritize interventions that balance outreach, efficiency, and financial stability for inclusive growth.

TABLE 5. Preference Score

	Preference Score
Global Findex Database	2.77600
Microfinance Information Exchange	2.63249
IMF Financial Access Survey	2.81706
National Sample Survey	3.40592
Similar MFI-level data	3.18121

Table 5 displays the preference scores calculated using the Weighted Product Method (WPM), summarizing the overall performance of each data source across four key criteria: Loan Disbursement Rate, Client Outreach, Loan Default Rate, and Operational Costs. A higher preference score indicates better overall effectiveness in promoting financial inclusion. The National Sample Survey (NSS) achieves the highest score of 3.40592, highlighting its strong balance of high client outreach and minimal loan defaults with moderate costs. Similar MFI-level data follows with 3.18121, showing robust outreach and cost efficiency. The IMF Financial Access Survey scores 2.81706, reflecting high loan disbursement and consistent performance. Meanwhile, the Global Findex Database and Microfinance Information Exchange (MIX) score 2.77600 and 2.63249 respectively, indicating comparatively lower efficiency. These scores aid policymakers in identifying the most impactful data sources and strategies for optimizing financial access and inclusion.

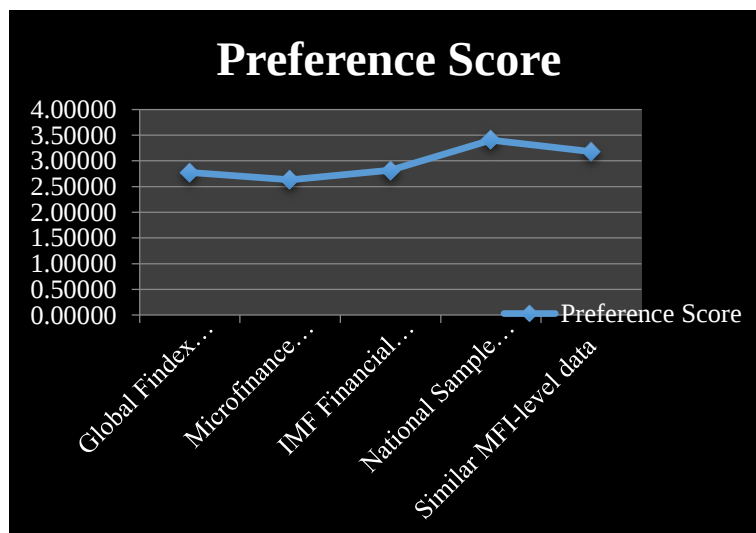


FIGURE 2. Preference Score

Figure 2 illustrates the preference scores of five major data sources involved in evaluating microfinance and financial inclusion using the Weighted Product Method (WPM). Among these, the National Sample Survey (NSS) stands out with the highest score of 3.40592, indicating its superior performance across key indicators such as client outreach, low default rates, and cost-effectiveness. Similar MFI-level data follows closely with a score of 3.18121, reflecting strong operational efficiency and reliability in service delivery. The IMF Financial Access Survey secures a mid-range score of 2.81706, driven by high disbursement rates and balanced metrics. In contrast, the Global Findex Database

(2.77600) and Microfinance Information Exchange (MIX) (2.63249) trail behind, suggesting areas for improvement in either cost control or outreach impact. This comparative analysis helps in prioritizing data-driven strategies for enhancing financial inclusion through more effective microfinance interventions.

TABLE 6. Rank

	Rank
Global Findex Database	4
Microfinance Information Exchange	5
IMF Financial Access Survey	3
National Sample Survey	1
Similar MFI-level data	2

Table 6 presents the final ranking of five data sources based on their preference scores derived through the Weighted Product Method (WPM). The National Sample Survey (NSS) secures the 1st rank, indicating its overall excellence in financial inclusion performance, particularly due to its balance of low operational costs and high loan efficiency. Similar MFI-level data is ranked 2nd, reflecting its strong client outreach and cost-effectiveness despite a relatively lower loan disbursement rate. The IMF Financial Access Survey, ranked 3rd, performs well in disbursement and outreach but is slightly offset by higher costs. Meanwhile, the Global Findex Database and Microfinance Information Exchange (MIX) are ranked 4th and 5th respectively. These lower ranks suggest challenges such as higher loan default rates and operational inefficiencies. This ranking framework offers valuable guidance for policymakers and financial institutions aiming to select optimal data-driven strategies for improving financial access.



FIGURE 3. Rank

Figure 3 presents a ranking of financial inclusion data sources based on their preference scores derived through the Weighted Product Method (WPM). The National Sample Survey (NSS) emerges as the top-ranked source, reflecting its strong overall performance in key indicators like loan disbursement rates, client outreach, and operational cost efficiency. This high rank suggests that NSS provides the most favorable conditions for fostering financial inclusion. The Similar MFI-level data follows closely in 2nd place, with a solid balance of factors like loan default rates and operational costs, despite a slightly lower client outreach. The IMF Financial Access Survey holds the 3rd position, showing good performance in disbursement and outreach but facing challenges with high operational costs. In 4th and 5th positions, the Global Findex Database and Microfinance Information Exchange (MIX) rank lower, indicating relative inefficiencies in certain areas such as loan default rates and operational costs.

4. CONCLUSION

The results of this study highlight how important microfinance organizations and telecommunications infrastructure are to enhancing financial inclusion in developing nations like India. The study rigorously evaluated the effectiveness of microfinance programs across important performance metrics, such as loan disbursement rates, using the Weighted Product Methodology (WPM) Connectivity, default rates, and operational costs. Through this analytical approach, we identified priority areas and optimal strategies that can accelerate the financial inclusion of the marginalized

population. The empirical insights gained from this study support the hypothesis that the introduction and strategic expansion of microfinance bank (MFB) branches, especially in unbanked areas, can significantly improve financial access, especially in the early years. By integrating geographic data and satellite imagery to measure economic activity via nighttime light intensity, we were able to correlate micro-level financial inclusion with broader socio-economic improvements. However, financial inclusion efforts need to extend beyond access. As the study reveals, there are serious concerns about gender disparities in digital literacy, trust in financial technologies, and use and adoption. For example, less educated women are more likely to be vulnerable to digital fraud, and are less confident in using tools such as mobile banking and ATMs. Therefore, policy interventions need to be inclusive and proactive, focusing on education, digital security, and trust-building efforts tailored to vulnerable groups. Furthermore, while microfinance continues to be a powerful tool for economic empowerment, it needs to evolve beyond narrow neoliberal models that prioritize individual success over community-based solidarity. The sustainability of microfinance initiatives depends not only on financial metrics, but also on how well they integrate with broader institutional and social networks. A reorientation of the microfinance philosophy is needed – one that embraces cooperative models, social ownership, and development synergy across sectors. The WPM methodology has proven to be efficient and transparent in managing complex, multidimensional datasets and prioritizing alternatives. Its ability to isolate the influence of individual criteria without introducing ranking distortions enhances its application in real-world policy contexts. Therefore, we recommend its broader use in financial inclusion policy analysis, not only in India but also in other developing economies seeking to reduce systemic inequalities. For financial inclusion to truly make a difference, it must be designed to be data-driven, community-centered, and inclusive. By aligning infrastructure development, technological innovation, and policy reforms, stakeholders can ensure that financial systems become engines of empowerment and equality.

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