

# FINANCIAL INCLUSION 2.0: AI-DRIVEN SOLUTIONS FOR CLOSING THE CREDIT GAP AMONG MSMEs

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## Abstract

Financial inclusion is the key pillar of developmental policies and India is a pioneer country in financial inclusion bringing about fifty crore individuals in the ambit of formal financial institution with the help of Pradhan Mantri Jan Dhan Yojana (PMJDY). However, credit inclusion part of financial inclusion shows a gloomy picture for individuals and specifically among Micro, Small and Medium Enterprises (MSMEs). Credit inclusion is a win-win for both individual and banking industry. There are both demand-side and supply-side challenges of credit inclusion which can overcome by use of technologies. To address this credit gap, the role of Artificial Intelligence (AI) can prove catalytic effect in initiating the part two of financial inclusion with emphasis on credit inclusion among MSMEs. It can unlock the new era of credit delivery that enhance accessibility, affordability, credit appraisal, transparency, risk management, recovery and governance. Though use of AI in banking sector is not free from risk but using it with ethics and responsibility can ensure inclusion, resilience and financial stability, positioning AI as an enabler of sustainable and inclusive credit rather than a substitute for human judgment.

**Keywords:** *Financial inclusion, Credit inclusion, Artificial Intelligence, Credit gap, MSME*

## Introduction

Financial inclusion is the process of providing

basic financial services to underserved or unserved individual or business entities at the affordable rates, on time and in transparent manner. In the last decade, India's banking system has exhibited a tremendous improvement in the area of financial inclusion. India's financial inclusion policies like providing banking services, affordable credit, digital payment, insurance and pension products and financial literacy have culminated into many initiatives like Pradhan Mantri Jan Dhan Yojana (PMJDY), Priority Sector Lending (PSL), Pradhan Mantri MUDRA Yojana, Stand up India, Unified Payments Interface (UPI), Aadhar Enabled Payment Service (AEPS), Pradhan Mantri Suraksha Bima Yojana (PMSBY), Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY), Atal Pension Yojana (APY) and National Centre for Financial Education (NCFE). RBI's financial inclusion index also indicates a steady rise from 53.9 in 2021 to 67.0 in 2025 (RBI, 2025). Despite this progress in access to basic accounts and payments, a persistent credit gap continues to constrain the potential of individuals, small enterprises, farmers and underserved groups. Traditional credit assessment models, which rely heavily on collateral and historical data, often exclude those lacking formal financial footprints. Though we have improved a lot in many dimensions of financial inclusion, however, we need to travel a long distance in credit inclusion. MSME sector, the backbone of India's Gross Domestic Product (GDP), lack access to formal credit.

In this context, Financial Inclusion 2.0 signifies a new

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phase of inclusion driven by Artificial Intelligence (AI), alternative data systems and digital public infrastructure. This phase focuses not merely on access to bank accounts but on equitable access to meaningful credit, risk-based pricing and customer-centred financial services. AI presents a transformative opportunity to bridge India's multi-layered credit gap by enabling more precise, low-cost and scalable credit decisions. AI-based solutions are, thus, likely to emerge as game changer that have important implications for expanding credit inclusion.

### Why Credit Inclusion?

Credit inclusion is a win-win for both customer and banking industry. From the customers' point of view, credit provides income growth and act as a financial security and shock absorber. Credit from formal financial institutions protect customer from exorbitant interest rates of money lenders. It helps in asset creation and strengthen social and economic mobility, hence, improving social welfare. Small pocket credit empowers marginalised group and helps in credit footprints for future larger credit. For banks, it helps in diversification of loan portfolio to different income and geographic group reducing concentration risk. Small pocket loans improve long-term stability as it generates sustainable interest income and cross-selling opportunities. It strengthens compliance and social mandates in the form of Priority Sector Lending (PSL) and social responsibility improving banks' reputation. Credit inclusion done through digital banking and AI technologies can reduce operating cost and improve risk assessment.

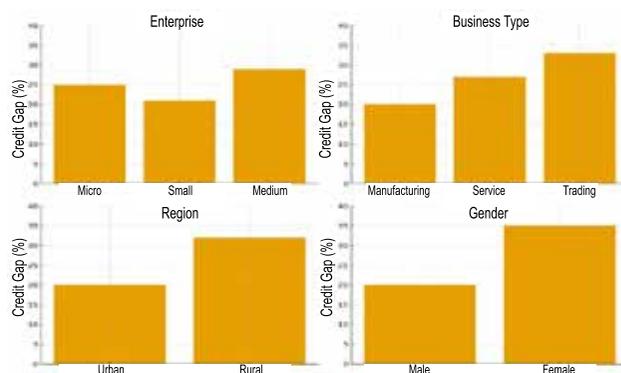
### Credit Gap: Causes and Challenges

Despite significant progress in financial inclusion, a sustainable credit gap continues to persist within the Indian financial system. Large chunks of individuals and business entities especially, MSME remain outside the ambit of formal credit. In a report titled

"Enhancing MSME's Competitiveness in India" submitted by NITI Aayog to Government of India reveals that only 19 percent of MSME credit demand was met by formal financial institutions by year 2021 and about 80 lakh crore credit demand were unmet (PIB, 2025) and only 25 percent of Indian adult population have formal access to institutional credit (RBI, 2025). In a report on MSME submitted by Small Industries Development Bank of India (SIDBI), it was found that out of 64 lakh crore rupees of addressable debt demand, only 34 lakh crore was supplied and 30 lakh crores remained unmet (SIDBI, 2025).

Figure 1 presents a comparative view of credit gaps across four key MSME segments - enterprise type, business activity, region and gender. The data clearly shows that medium enterprises (29%) face the highest gap within enterprise categories, while trading units (33%) experience the largest shortfall among business types. Regionally, the credit gap is more pronounced in rural areas (32%) compared to urban centres. The most significant disparity appears in gender-based access, where female-owned enterprises show a credit gap of 35%, far higher than male-owned units. Overall, it highlights persistent structural inequities that continue to restrict inclusive credit delivery.

**Figure 1: Multidimensional Assessment of Credit Gaps in the MSME Sector**



Source: TransUnion CIBIL and Small Industries Development Bank of India (2025)

**Figure 2: Causes of Credit Gap**

Demand-side	Supply-side
<ul style="list-style-type: none"> <li>• Limited financial literacy</li> <li>• Fear of formal and complex loan procedure</li> <li>• Lack of documentation</li> <li>• Irregular or seasonal cash flow</li> <li>• Dependence on informal credit source</li> </ul>	<ul style="list-style-type: none"> <li>• Information asymmetry</li> <li>• Collateral-based lending norms</li> <li>• High perceived credit risk</li> <li>• Limited branch penetration</li> <li>• Slow processing and disbursement</li> <li>• Lack of tailored credit product</li> <li>• High interest rate</li> </ul>

Source: Author's compilation

The persistence of a credit gap in the financial system arises from a combination of demand-side, barriers and supply-side constraints. On the demand-side, limited financial literacy, fear of formal and complex loan procedures, lack of proper documentation and irregular or seasonal cash flows discourage individuals and small enterprises from seeking formal credit. Many borrowers also continue to depend on informal credit sources due to ease of access, despite higher costs. On the supply-side, lenders face significant information asymmetry, which restricts their ability to accurately assess borrowers' risk. This leads to collateral-based lending norms, higher perceived credit risk and relatively high interest rates. Further, challenges include limited branch presence in remote areas, slow loan processing, delayed disbursements and the absence of tailored credit products that suit diverse borrowers' needs. Together, these factors create a structural mismatch between credit demand and supply, contributing to a persistent credit gap in the financial system.

**Artificial Intelligence: Unlocking a new era of Credit Inclusion**

Revolution in credit inclusion required harnessing new technology and banking sector has always embraced new technologies for its improvement. In present scenario, cutting edge technologies in this sector are not just limited to data management at backend but has entered into vanguard to shape customer experience, strengthening security and enabling faster, smarter and more inclusive

financial service intelligently. Among emerging technologies, Artificial Intelligence (AI) is not just enhancing credit assessment - it is redefining who gets access to finance, how decisions are made and how underserved borrowers can finally be seen, heard and included. AI has the potential to expedite the process throughout the credit cycle from credit inclusion, credit appraisal, monitoring, customizing, document management, cyber security, grievance management and recovery.

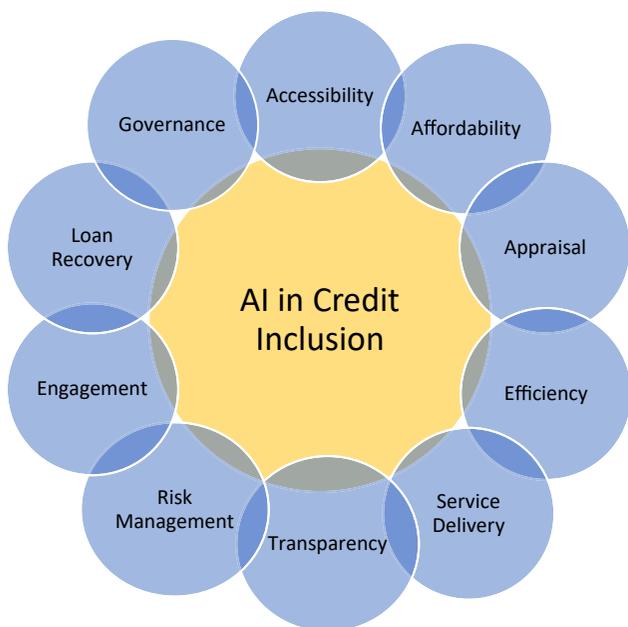
**Table 1: AI Adoption in Indian Banks**

Bank Name	AI Tool/Project	Key Applications
HDFC Bank	Electronic Virtual Assistant (EVA), Predictive Analytics, AI Fraud Detection	Customer query handling, cross-selling, customer retention, real-time fraud detection
ICICI Bank	AI Software Robotics, AI Credit Scoring, Robo-Advisory	Process automation, credit approvals, personalized investment advice
Axis Bank	Aha! Chatbot, AI Fraud Monitoring, AI Document Verification	Multilingual customer service, suspicious transaction alerts, automated loan processing
Kotak Mahindra Bank	Keya Voicebot, AI KYC Verification	Natural Language Processing (NLP)-based voice banking, digital customer onboarding
IndusInd Bank	AI Video Banking, Loan Analytics	Remote transactions, repayment risk monitoring
State Bank of India	SIA, YONO App, AI Fraud Detection	Customer service chatbot, personalized banking offers, compliance monitoring
Punjab National Bank	AI Risk Assessment Tools	Loan evaluation, fraud detection

Bank of Baroda	AI Chatbots, AI Predictive Models	Customer interaction, loan recovery, customer retention
Canara Bank	AI Transaction Monitoring, AI Chatbots	Suspicious activity detection, automated query handling
Union Bank of India	AI AML Compliance, NLP-Based Systems	Anti-money laundering checks, multilingual customer support

Source: Srinivas & Katla (2025)

**Figure 3: Use of AI in Credit Inclusion**



Source: Author's compilation

AI-driven tools improve accessibility by allowing remote onboarding through Aadhaar-based e-Know Your Customer (KYC) and video verification, helping rural borrowers access formal credit without visiting bank branches. AI is transforming access to credit by moving beyond traditional branch-based lending and embracing new methods of customer assessment. Banks are using AI and analytic-based models to maintain or upgrade based on customer density, demographic shift, digital adoption rate, transaction pattern and operational overhead (Jain, 2025). By

analysing digital footprints, utility bill payments, mobile usage patterns and real-time cash flows, AI enables banks to evaluate borrowers who were previously unserved or underserved. This approach allows even remote customers - far from brick-and-mortar branches - to be brought into the formal credit system with speed, accuracy and dignity. It enhances affordability by reducing operational costs, enabling fintechs like Paytm, BharatPe and small finance banks to offer low-ticket digital loans. In credit appraisal, AI models analyse alternative data—such as mobile usage, Goods and Services Tax (GST) filings, UPI transaction history and farm activity patterns, financial institution will access creditworthiness more accurately who lack traditional credit histories bringing millions of customers in formal credit channel. AI projected to improve efficiency by 46 percent and Indian AI finance market expect to cross 1.02 lakh crore by 2033 (ETBFSI Research, 2025). It strengthens service delivery through automated disbursement and digitally signed repayment schedules. Greater transparency is achieved by using explainable AI algorithms that show why a loan was accepted or rejected, reducing information asymmetry for customers. AI-based risk management tools detect fraud patterns, flag suspicious UPI transactions and predict repayment behaviour, enabling safer expansion of credit. In a study done by Naidu et al. (2025), accuracy of fraud detection has been enhanced by AI tool from 65 percent to 92 percent and financial losses has reduced by 28 percent. Banks and Non-Banking Financial Companies (NBFCs) also use AI for personalised customer engagement, such as reminders in regional languages or WhatsApp-based support. In loan recovery, AI bots help reschedule Equated Monthly Instalments (EMIs) or identify early signs of distress, reducing the need for coercive recovery practices. The study done by Kshetri (2021) found that in United States of America (USA), financial

institutions, actively using AI, reported to have less Non-Performing Asset (NPA) than the institution not using it. Finally, AI enhances governance by ensuring regulatory compliance, monitoring Know Your Customer (KYC) anomalies and aligning with Reserve Bank of India's (RBI's) Digital Lending Guidelines. Together, these applications demonstrate how AI can build a more inclusive, transparent and responsible credit ecosystem in India.

### Not without Risks

The adoption of AI has also brought many associated risks that requires attention and must be tackled effectively.

**Figure 4: Risks of Using AI in Banking Sector**

<b>Data Related Risks</b>	<ul style="list-style-type: none"> <li>Data Quality Risks, Data Privacy Concerns, Disinformation Risk, IPR Issues</li> </ul>
<b>Operational and Implementation Risks</b>	<ul style="list-style-type: none"> <li>Incorrect Integration with Legacy System, Human Skill Gaps and Change Management Issue, Concentration Risk</li> </ul>
<b>Regulatory and Compliance Risks</b>	<ul style="list-style-type: none"> <li>Difficulty in Auditability and Supervision, Lack of Standardised Guideline, Regulatory Compliance Challenges</li> </ul>
<b>Customer Centric and Ethical Risks</b>	<ul style="list-style-type: none"> <li>Loss of Human Touch, Fairness and Ethical Concern, Customer Acceptance and Trust Issue</li> </ul>
<b>Model and Algorithmic Risks</b>	<ul style="list-style-type: none"> <li>Model Risk, Algorithmic Bias, Opaque Decision Making, Market Correlation</li> </ul>
<b>Cyber and Technology Risks</b>	<ul style="list-style-type: none"> <li>Infrastructure and Technology Constraints, Cyber Security Threat, Third Party dependency</li> </ul>

Source: Author's compilation

**Data Related Risk:** Data is the lifeline of AI and its efficiency depends on the quality of data on which AI is modelled. Fragmented, inaccurate, incomplete, outdated and historically skewed datasets, privacy breaches, information leak and even AI generated disinformation can lead to suboptimal and severely distorted decision-making. Issues of intellectual property rights can further complicate ownership of data and algorithm.

**Operational and Implementation Risk:** Reliance on third-party for providing cloud technology, infrastructure and datasets are subjected to a single point of failure. AI infrastructures are costly to implement and its operations require highly

skilled staff for which banking sector require huge investment in its human resource upgradation. The adoption of AI in banking often creates a conception of trade-off between technologies and staff leading to apprehensions among employee. It is also found in the study that smaller banks have more difficulty in adopting AI due to higher fixed cost and lack of economies of scale (Stanly, 2024). This finding is also supported by the study of Goel et al. (2024) that larger and better capitalised banks are more likely to adopt AI.

**Regulatory and Compliance Risk:** AI in banking growing much faster than the rules and policies govern it, creating significant challenges for Regulated Entities. The lack of transparency possesses difficult for regulators, auditors and bank officials to verify its fairness, accuracy and accountabilities. It has become difficult for regulators to set a boundary line between decisions of human and human like AI.

**Customer Centric and Ethical Risk:** AI in banking also raises the question of ethical expectation, customer trust and comfort. It may be difficult for banks to adopt AI in decision-making on the sensitive issues like credit approval, dispute relating to finance and credit restructuring. Ethics is main concern in AI decision-making. AI system lacks human value like empathy, sympathy, integrity etc. which are essential for fair, inclusive and sensitive financial decisions. If AI model lacks these values or contains biases or make decision without proper human oversight, certain groups may feel excluded. Lack of human touch in loan recovery or complex financial needs is the important concern relating to AI.

**Model and Algorithmic Risk:** Unlike traditional credit models that follow fixed rules, the internal decision-making of AI models is complex and not easily visible. They learn from the data they are trained on. If this data contains bias or mistakes, the AI can also learn those biases. As a result, the model may give unfair

decisions such as rejecting a deserving borrower or approving someone whose risk is actually high (Rao, 2025). This lack of transparency can unintentionally harm certain groups and weaken trust in the lending process.

**Cyber Risks:** As digital and AI in banking expands, so does cyber frauds. The cases and costs of cyber threats are quadrupling year-on-year (Sharma, 2025). Use of AI in banking sector can also be mimicked by cyber attacker. It can be used for hyper realistic deepfake scams, AI social engineering (fake banking personnel), synthetic identity frauds, Data poisoning, advance phishing etc. leading to operational and reputational damage including heavy financial losses.

### **Future Outlook: The GAP Framework**

The future of AI in banking sector is promising, the successful bridging of credit gaps in India's financial system will depend on the responsible adoption of GAP AI - Generative, Analytic and Predictive AI - within a framework anchored in trust, transparency and human oversight. While generative AI can shift the customer engagement to the next level by enabling intelligent virtual assistant, multilingual interface, automated documentation and enhancing accessibility. Analytic AI will act as backbone of operational efficiency and regulatory compliance. It will strengthen credit appraisal, risk assessment, fraud detection and portfolio monitoring deepen MSME and agriculture credit by incorporating alternative data in line with regulatory compliance. Predictive AI plays a crucial role in financial resilience and inclusion by forecasting borrowers' behaviour, stress pattern and early warning signals resulting in reducing Non-Performing Asset (NPA) and supporting responsible lending to existing individual and business entities, informal enterprises and first-time borrowers. The future effectiveness of GAP AI will rest on robust technological infrastructure, continuous training of bankers and regulators and improved AI literacy

among individuals to build confidence and informed participation in AI-assisted credit processes. Equally important is togetherness, reflected in collaboration among banks, Fintech, policymakers and academia. Guided by FREE-AI principles such as Fair, Responsible, Explainable and Ethical, AI without responsibility and ethics is like technology without conscience capable of increasing lending yet exclusion and instability. AI adoption can ensure inclusion, resilience and financial stability, positioning AI as an enabler of sustainable and inclusive credit rather than a substitute for human judgment.

### **Conclusion**

AI adoption in Indian banking is still at nascent stage, but it shows strong potential to reduce human errors, lower operational costs and improve decision-making. While challenges such as the AI talent gap and data governance remain, responsible use of AI can enhance risk management, fraud detection, customer service and regulatory compliance. If designed with transparency and respect for customer dignity and privacy, AI can boost trust and help bridge the credit gap by accounting for the emotional, social and economic realities of the financially excluded individual and business entities. Overall, AI holds a bright future in advancing financial inclusion, resilience and efficiency in the banking sector. In conclusion, the future of inclusive credit lies in a GAP-AI framework grounded in trust, transparency, training and togetherness, guided by FREE-AI principles and strengthened by widespread AI literacy, where artificial intelligence complements rather than replaces human judgment.

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