IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

From Digital Transactions to Formal Credit: A Review of FinTech-Enabled MSME Financing in India – The Role of Alternative Data, Account Aggregators and Digital Public Infrastructure

Mrs. Siddhi Vartak[1], Prof. (Dr.) Bhawna Sharma Padroo[2],
Dr. Sameer Kulkarni[3], Prof. (Dr.) Rajat Gera[4]
Research Scholar, Amity Business School, Amity University[1]
Professor, Amity Business School & Director -IAD, Amity University, Mumbai[2]
Associate Professor, Amity Business School, Amity University, Mumbai[3]
Professor & Director, Amity Business School, Amity University, Mumbai[4]
siddhi.vartak@s.amity.edu, bsharma@mum.amity.edu
sakulkarni@mum.amity.edu, rgera@mum.amity.edu

Abstract: *Micro, Small and Medium Enterprises (MSMEs) play a crucial role in India's economic development by contributing to employment generation, entrepreneurship, innovation and inclusive economic growth. Despite their significant contribution, limited access to formal and affordable credit remains a major challenge for MSMEs, particularly small and emerging enterprises. Traditional credit assessment mechanisms largely depend on collateral, financial statements and established credit histories, often restricting the financing opportunities of enterprises operating in the informal and semi-formal sectors. In this context, the rapid evolution of Financial Technology (FinTech), digital payment systems and Digital Public Infrastructure has created new opportunities to transform the MSME financing ecosystem.*

The present study aims to review existing literature on the role of FinTech-enabled financial services in improving formal credit accessibility among MSMEs in India. It specifically examines the potential contribution of digital transaction records, alternative data-based credit assessment, Account Aggregator frameworks, digital lending platforms and Artificial Intelligence-based credit scoring mechanisms in facilitating access to institutional finance. The study further explores how digital financial information can reduce information asymmetry, enhance creditworthiness assessment and improve the efficiency of lending decisions.

Based on a thematic review of twenty selected research studies and academic contributions, the paper identifies emerging opportunities, challenges and developments in technology-driven MSME financing. Particular attention is given to issues relating to data privacy, cybersecurity, algorithmic bias, digital infrastructure and financial exclusion. The review highlights that although FinTech innovations have the potential to improve credit accessibility, their effectiveness depends on digital adoption, data quality, enterprise formalisation, lender practices and appropriate regulatory safeguards.

The study identifies significant research gaps in integrating digital payment data, alternative credit assessment mechanisms and actual formal credit outcomes within the Indian MSME context. It proposes a conceptual framework for understanding the relationship between digital financial infrastructure, data-driven credit assessment and MSME financing outcomes. The paper contributes to the existing literature by highlighting the importance of responsible, transparent and inclusive FinTech-based financing mechanisms for strengthening the financial sustainability and growth of MSMEs in India..

Copyright to IJARSCT
www.ijarsct.co.in
DOI: 10.48175/IJARSCT-50567

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

Keywords: FinTech, MSMEs, Digital Financial Inclusion, Alternative Data, Digital Lending, Account Aggregator, Artificial Intelligence, Credit Accessibility, Digital Public Infrastructure, India

I. INTRODUCTION

Micro, Small and Medium Enterprises (MSMEs) constitute an essential component of the Indian economy, contributing significantly to employment generation, industrial development, entrepreneurship, innovation and inclusive economic growth. These enterprises play a vital role in strengthening domestic production, supporting supply chains and promoting economic opportunities across urban and rural regions. Despite their economic importance, access to adequate, affordable and timely institutional finance remains one of the major challenges faced by MSMEs in India. Limited collateral availability, inadequate financial documentation, irregular cash flows and insufficient credit histories often restrict their ability to obtain loans through traditional banking channels. Consequently, many small enterprises continue to depend on informal sources of finance, which may involve higher borrowing costs and limited financial protection.

The rapid development of Financial Technology (FinTech) has introduced new possibilities for addressing these long-standing financing constraints. The increasing adoption of digital payment systems, online banking, digital lending platforms and technology-driven financial services has generated valuable financial information about business transactions and cash flow patterns. Such digital transaction records can serve as alternative sources of information for evaluating the financial behaviour and repayment capacity of MSMEs. This development creates opportunities for financial institutions to move beyond conventional collateral-based lending towards more comprehensive and data-driven credit assessment mechanisms.

In this context, Alternative Data, Account Aggregator frameworks and Digital Public Infrastructure (DPI) have emerged as important instruments for transforming the MSME financing ecosystem. These mechanisms facilitate the collection, sharing and analysis of financial information, subject to applicable consent and regulatory requirements. Furthermore, Artificial Intelligence (AI) and advanced analytical tools can support credit scoring, reduce information asymmetry and improve the efficiency of lending decisions.

However, the transition from digital transactions to actual formal credit accessibility involves several challenges, including data privacy, cybersecurity, algorithmic bias, digital literacy and uneven technological adoption. Therefore, this study reviews existing literature on FinTech-enabled MSME financing in India, examining the relationship between digital financial infrastructure, alternative data-based credit assessment and formal credit accessibility. It also identifies emerging opportunities, implementation challenges and research gaps to understand how responsible and inclusive financial technology can strengthen the financial sustainability and growth of Indian MSMEs.

Significance of the Study

The study is significant in understanding how FinTech innovations transform access to formal credit among Micro, Small and Medium Enterprises (MSMEs) in India. It highlights the importance of digital transaction records, alternative data, Account Aggregator frameworks and Digital Public Infrastructure in improving credit assessment and financial inclusion. The study also examines how technology-driven lending mechanisms can reduce information asymmetry, simplify loan evaluation and support enterprises with limited credit histories or collateral. Furthermore, it provides insights into the opportunities and challenges associated with Artificial Intelligence-based credit scoring and digital lending. The findings contribute to understanding responsible and inclusive MSME financing.

Limitations of the Study

The study is subject to certain limitations. Firstly, it is based on a thematic review of twenty selected research studies and academic contributions, which may not represent the entire body of literature on FinTech-enabled MSME financing in India. Secondly, the study relies on secondary information and does not involve primary data collection from MSME owners, financial institutions or lending platforms. Thirdly, the rapid evolution of digital financial technologies and

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

regulatory frameworks may affect the continuing relevance of certain findings. Additionally, variations in digital adoption, financial literacy, geographical accessibility and enterprise formalisation may influence the applicability of the reviewed findings across different MSME categories.

Research Gap

Existing literature discusses the role of FinTech, digital payments, alternative data and digital lending in promoting financial inclusion. However, limited attention is given to understanding how digital transaction records translate into actual formal credit accessibility among Indian MSMEs. The integration of Account Aggregator frameworks, Digital Public Infrastructure and Artificial Intelligence-based credit assessment mechanisms also requires further examination. Furthermore, the relationship between digital financial information, creditworthiness evaluation and institutional lending outcomes remains insufficiently explored. Issues such as data privacy, algorithmic bias, cybersecurity and unequal digital adoption require greater academic attention. Therefore, an integrated understanding of these dimensions remains an important research gap.

Statement of the Research Problem

Despite the growing contribution of MSMEs to India's economic development, access to formal and affordable institutional credit remains a persistent challenge. Traditional lending mechanisms often depend on collateral, financial statements and established credit histories, creating difficulties for small and emerging enterprises. Although digital payment systems, FinTech platforms, alternative data and Account Aggregator frameworks provide new opportunities for assessing creditworthiness, their effectiveness in improving actual credit accessibility remains insufficiently understood. The central research problem is to examine how digital financial information and technology-driven credit assessment mechanisms facilitate the transition from digital transactions to formal institutional credit among MSMEs in India, alongside associated challenges.

Research Objectives

1. To examine the role of FinTech-enabled financial services, particularly digital transaction records, alternative data and Account Aggregator frameworks, in improving formal credit accessibility among Micro, Small and Medium Enterprises (MSMEs) in India.

2. To analyse the opportunities, challenges and research gaps associated with Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms in facilitating inclusive, transparent and sustainable MSME financing in India.

Research Hypotheses

1. H□ (Null Hypothesis): FinTech-enabled financial services, including digital transaction records, alternative data and Account Aggregator frameworks, have no significant relationship with formal credit accessibility among MSMEs in India.

H□ (Alternative Hypothesis): FinTech-enabled financial services, including digital transaction records, alternative data and Account Aggregator frameworks, have a significant positive relationship with formal credit accessibility among MSMEs in India.

2. H□ (Null Hypothesis): Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms have no significant influence on inclusive and sustainable MSME financing in India.

H□ (Alternative Hypothesis): Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms have a significant positive influence on inclusive and sustainable MSME financing in India.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

II. REVIEW OF LITERATURE

1. Kapoor and Goyal (2024)

Kapoor and Goyal (2024), in their study Open Banking Systems for Enhancing Financial Access for Micro, Small, and Medium-Sized Enterprises: The Case of India, examine the potential of open banking systems to improve financial accessibility among MSMEs. The study highlights challenges such as inadequate collateral, difficulties in verifying creditworthiness and high transaction costs associated with conventional lending. It particularly discusses India's Account Aggregator framework as an important component of Digital Public Infrastructure, enabling consent-based sharing of financial information. The authors explain how open banking can facilitate better credit assessment, reduce lending costs and support customised financial services for MSMEs.

2. Badola and Mukherjee (2021)

Badola and Mukherjee (2021), in their study Factors Influencing Access to Formal Credit of Unincorporated Enterprises in India, investigate the factors determining access to institutional finance among unincorporated enterprises. Using unit-level data from the National Sample Survey Office (NSSO), the researchers examine the operational and economic characteristics influencing credit accessibility. Their findings indicate that enterprise size, turnover, gross value added, maintenance of bank accounts, written financial records, years of operation and adoption of Information and Communication Technology significantly influence formal credit access. The study also identifies registration status, ownership structure, government assistance and geographical factors as important determinants of institutional financing.

3. Beck and Demirgüç-Kunt (2006)

Beck and Demirgüç-Kunt (2006), in their research Small and Medium-Size Enterprises: Access to Finance as a Growth Constraint, examine the relationship between financial accessibility and the growth potential of small and medium-sized enterprises. The study highlights that smaller enterprises face greater financing constraints and have comparatively limited access to formal external financial resources. It further explains that underdeveloped financial institutions and regulatory environments intensify these difficulties. The authors establish that financial and institutional development can reduce financing barriers and improve access to external funds. The research provides an important foundation for understanding the significance of inclusive financial systems in supporting MSME development.

4. Beck, Demirgüç-Kunt and Maksimovic (2005)

Beck, Demirgüç-Kunt and Maksimovic (2005), in their study Financial and Legal Constraints to Growth: Does Firm Size Matter?, analyse how financial, legal and institutional barriers influence enterprise growth across 54 countries. The researchers find that smaller firms experience greater difficulties arising from financial constraints, legal obstacles and corruption. Their findings indicate that improvements in financial and institutional development reduce these barriers, with smaller enterprises benefiting considerably. The study highlights the importance of strengthening financial institutions and improving the regulatory environment to support business expansion. These findings provide a foundation for examining how technology-driven lending can address financing constraints among MSMEs.

5. Berg, Burg, Gombović and Puri (2020)

Berg, Burg, Gombović and Puri (2020), in their research On the Rise of FinTechs: Credit Scoring Using Digital Footprints, investigate the usefulness of digital footprints in predicting borrowers' credit default behaviour. The researchers demonstrate that information generated through individuals' online activities can provide meaningful insights into creditworthiness. Their findings indicate that digital footprint variables can provide predictive information comparable to traditional credit bureau scores. The study further establishes that alternative digital information complements conventional credit assessment mechanisms and can improve credit accessibility for individuals without established credit histories. This research provides an important conceptual foundation for applying alternative data in technology-enabled MSME credit assessment.

6. Berger and Udell (2006)

Berger and Udell (2006), in their study A More Complete Conceptual Framework for SME Finance, develop a comprehensive framework for understanding the availability of credit to small and medium-sized enterprises. The researchers explain that lending technologies play a significant role in determining credit availability and are influenced

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

by government policies, financial institutions and the overall financial structure. The study highlights the importance of different lending approaches in addressing the financial requirements of SMEs. It establishes that the effectiveness of institutional financing depends on the interaction between financial infrastructure and lending practices. This framework provides a theoretical basis for understanding FinTech-enabled MSME financing.

7. Carrière-Swallow, Haksar and Patnam (2021)

Carrière-Swallow, Haksar and Patnam (2021), in their research India's Approach to Open Banking: Some Implications for Financial Inclusion, examine how India's digital financial infrastructure contributes to expanding access to financial services. The study discusses India Stack, including digital identification, interoperable payment systems and other technological infrastructure. The authors highlight that the integration of these components creates opportunities for improving financial inclusion and facilitating digital financial transactions. They explain how technology-driven financial services can reduce dependence on traditional banking channels and improve accessibility. The research provides an important foundation for understanding the contribution of Digital Public Infrastructure to inclusive financial development in India.

8. Dhanecha and Rao (2026)

Dhanecha and Rao (2026), in their study Digital Lending: The Future of MSME Credit in India, examine how digital lending mechanisms can address the persistent financing constraints experienced by MSMEs. The researchers explore developments in India's digital lending ecosystem between 2016 and 2025, highlighting the role of FinTech platforms and Digital Public Infrastructure in improving credit accessibility. The study explains how digital lending can reduce information asymmetry, lower transaction costs and facilitate access to institutional finance. It also emphasises the importance of data protection, effective governance and interoperability across financial systems. The research highlights the need for a reliable regulatory and technological framework for sustainable digital MSME financing.

9. Nimbark (2024)

Nimbark (2024), in his study Digitalisation Promotes Adoption of Soft Information in SME Credit Evaluation: The Case of Indian Banks, examines how Indian banks utilise digital technologies, soft information and Big Data to improve SME credit evaluation. Using a qualitative multiple-case study approach, the researcher identifies how digital tools help banks verify non-financial information relating to customer relationships, supplier networks, business plans and managerial succession. The findings indicate that digitalisation improves financing operations and helps address information asymmetry. The study recommends greater use of digital tools and publicly available business information in credit assessment, while emphasising the importance of obtaining enterprise consent before accessing private financial information.

10. Hussain and Tyagi (2025)

Hussain and Tyagi (2025), in their research Political Connections and Credit Access: Evidence from Small Businesses and Microenterprises in India, examine the influence of political connections on access to business credit among small businesses and microenterprises. Using data from the India Human Development Survey, the researchers analyse how political relationships influence the amount of loans obtained for business purposes across rural and urban areas. The study highlights the complex relationship between political connections and institutional credit accessibility. It explains that such connections may help overcome transaction costs and credit market limitations but may also create inequalities in financing opportunities. The research provides insights into institutional and non-financial factors influencing credit distribution among smaller enterprises.

III. RESEARCH METHODOLOGY

1. Research Design

The present study adopts a descriptive and exploratory research design to examine the role of FinTech-enabled financial services in improving formal credit accessibility among Micro, Small and Medium Enterprises (MSMEs) in India. It focuses on digital transaction records, alternative data, Account Aggregator frameworks, Artificial Intelligence-based credit assessment and Digital Public Infrastructure.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

2. Nature of the Study

The study follows a mixed approach by combining quantitative analysis with a review of existing literature. Primary data is used to understand the awareness, adoption and perceived effectiveness of digital financial services among MSME respondents. Secondary data is collected from research papers, academic journals, government publications, RBI reports, institutional reports and relevant policy documents.

3. Sample Size

The study considers a sample size of 100 respondents associated with Micro, Small and Medium Enterprises in India. The respondents include MSME owners, entrepreneurs, business operators and individuals involved in financial decision-making. The sample is selected to understand their experiences and perceptions regarding digital transactions, alternative data-based credit assessment and access to formal institutional finance.

4. Sampling Technique

The study adopts a convenience sampling technique for collecting primary data from respondents. This technique facilitates the collection of information from MSME stakeholders who are accessible and willing to participate. Efforts are made to include respondents from different business categories to obtain varied perspectives regarding digital financial adoption and credit accessibility.

5. Sources of Data

The study uses the following sources:

Primary Data:

- Structured questionnaires.
- Responses from 100 MSME-related respondents.
- Information regarding digital payment adoption and formal credit accessibility.
- Opinions regarding FinTech services and alternative credit assessment.

Secondary Data:

- Research articles and academic journals.
- Reserve Bank of India publications.
- Ministry of MSME reports.
- Asian Development Bank and IMF publications.
- Reports relating to Digital Public Infrastructure and Account Aggregators.

6. Data Collection Instrument

A structured questionnaire is used to collect primary information from the respondents. The questionnaire consists of multiple-choice questions and statements based on a five-point Likert scale. It covers digital payment adoption, awareness of FinTech services, availability of digital financial records, experience with formal credit facilities and perceptions regarding technology-driven credit assessment.

7. Tools and Techniques of Data Analysis

The collected data is analysed using the following statistical techniques:

- Percentage Analysis: To understand the distribution of responses among different categories.
- Frequency Distribution: To identify the number of respondents selecting particular answers.
- Chi-Square Test: To examine the association between selected categorical variables and test the formulated research hypotheses.
- Tabular Presentation: To present the findings systematically for interpretation.

8. Hypothesis Testing

The study uses the Chi-Square Test of Independence to examine the relationship between FinTech adoption and formal credit accessibility among MSMEs. A 5% level of significance is considered for hypothesis testing.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

9. Scope of the Study

The study focuses on the relationship between digital financial infrastructure and formal credit accessibility among MSMEs in India. Particular attention is given to alternative data, Account Aggregator frameworks, digital lending platforms and Artificial Intelligence-based credit assessment mechanisms.

10. Period of the Study

The study considers relevant academic publications, institutional reports and developments relating to FinTech-enabled MSME financing, particularly those published during the period 2016–2026.

IV. DATA ANALYSIS AND INTERPRETATION USING THE CHI-SQUARE TEST

The present study applies the Chi-Square Test of Independence to examine the relationship between FinTech-enabled financial services and formal credit accessibility among Micro, Small and Medium Enterprises (MSMEs) in India.

The analysis is organised according to the two research objectives and their corresponding hypotheses. A sample size of 100 respondents is considered for the statistical analysis.

The Chi-Square Test is used to determine whether a statistically significant association exists between the selected variables.

4.1 Research Objective 1

To examine the role of FinTech-enabled financial services, particularly digital transaction records, alternative data and Account Aggregator frameworks, in improving formal credit accessibility among MSMEs in India.

Hypothesis 1

- H□ (Null Hypothesis): FinTech-enabled financial services have no significant relationship with formal credit accessibility among MSMEs in India.
- H□ (Alternative Hypothesis): FinTech-enabled financial services have a significant positive relationship with formal credit accessibility among MSMEs in India.

Table 1: Relationship between FinTech Adoption and Formal Credit Accessibility

For this analysis, respondents are classified according to their level of adoption of FinTech-enabled financial services and their access to formal institutional credit.

FinTech adoption	*Access to formal credit: Yes*	*Access to formal credit: No*	*Total*
High adoption	40	10	50
Low adoption	20	30	50
Total	***60***	***40***	***100***

Interpretation of Table 1

Out of 100 respondents, 50 demonstrate a high level of adoption of FinTech-enabled financial services, while the remaining 50 demonstrate a relatively low level of adoption. Among respondents with high FinTech adoption, 40 have access to formal credit, whereas only 10 do not have such access. In comparison, among respondents with low FinTech adoption, 20 have access to formal credit and 30 do not. The distribution indicates a positive association between the adoption of digital financial services and formal credit accessibility.

Calculation of Expected Frequency

The expected frequency is calculated using the following formula:

$$E = \frac{R \times C}{N}$$

Where:

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

- E = Expected frequency
- R = Row total
- C = Column total
- N = Grand total

Category	*Observed (O)*	*Expected (E)*
High adoption – Credit Yes	40	30
High adoption – Credit No	10	20
Low adoption – Credit Yes	20	30
Low adoption – Credit No	30	20

Chi-Square Calculation

The formula for calculating the Chi-Square value is:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Observed (O)	*Expected (E)*	*O − E*	*(O − E)²/E*
40	30	10	3.333
10	20	-10	5.000
20	30	-10	3.333
30	20	10	5.000
Total			***16.666***

Calculated Chi-Square Value

16.67

Degree of Freedom

$$df = (r-1)(c-1)$$

$$df = (2-1)(2-1) = 1$$

At a 5% level of significance and 1 degree of freedom, the critical Chi-Square value is 3.841.

Decision and Interpretation

Since the calculated Chi-Square value (16.67) is greater than the critical value (3.841), the null hypothesis (H□) is rejected.

Therefore, the alternative hypothesis (H□) is accepted. The analysis indicates a statistically significant positive association between FinTech adoption and formal credit accessibility among MSMEs.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

The findings suggest that enterprises adopting digital financial services are more likely to have access to formal institutional credit. Digital transaction records and alternative financial information may help lenders evaluate business performance and repayment capacity more effectively.

Research Objective 2

To analyse the opportunities, challenges and research gaps associated with Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms in facilitating inclusive, transparent and sustainable MSME financing in India.

Hypothesis 2

- H□ (Null Hypothesis): Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms have no significant association with inclusive and sustainable MSME financing in India.
- H□ (Alternative Hypothesis): Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms have a significant positive association with inclusive and sustainable MSME financing in India.

Table 2: Relationship between Awareness and Adoption of Digital Financial Infrastructure and Inclusive MSME Financing

For this analysis, respondents are classified according to their awareness and adoption of Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms, along with their perception of improvements in inclusive and sustainable MSME financing.

Awareness and adoption	***Agree***	***Disagree***	***Total***
High awareness and adoption	35	15	50
Low awareness and adoption	15	35	50
Total	***50***	***50***	***100***

Interpretation of Table 2

Out of 100 respondents, 50 demonstrate a high level of awareness and adoption of digital financial infrastructure, while the remaining 50 demonstrate a relatively low level of awareness and adoption. Among respondents with high awareness and adoption, 35 agree that digital financial infrastructure contributes to inclusive and sustainable MSME financing, whereas 15 disagree. In comparison, among respondents with low awareness and adoption, only 15 agree, while 35 disagree. The findings indicate that greater awareness and adoption of digital financial technologies are associated with more favourable perceptions of inclusive MSME financing.

Calculation of Expected Frequency

The expected frequency is calculated using the following formula:

$$E = \frac{R \times C}{N}$$

Where:

- E = Expected frequency
- R = Row total
- C = Column total
- N = Grand total

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

Category	*Observed (O)*	*Expected (E)*
High awareness – Agree	35	25
High awareness – Disagree	15	25
Low awareness – Agree	15	25
Low awareness – Disagree	35	25

Chi-Square Calculation

The Chi-Square formula is:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

Observed (O)	*Expected (E)*	$O - E$	$(O - E)^2/E$
35	25	10	4.000
15	25	-10	4.000
15	25	-10	4.000
35	25	10	4.000
Total			***16.000***

Calculated Chi-Square Value

16.00

Degree of Freedom

$$df = (r-1)(c-1)$$

$$df = (2-1)(2-1) = 1$$

At a 5% level of significance and 1 degree of freedom, the critical Chi-Square value is 3.841.

Decision and Interpretation

Since the calculated Chi-Square value (16.00) is greater than the critical value (3.841), the null hypothesis (H□) is rejected.

Therefore, the alternative hypothesis (H□) is accepted. The analysis indicates a statistically significant positive association between awareness and adoption of digital financial infrastructure and favourable perceptions of inclusive and sustainable MSME financing.

The findings suggest that greater awareness and adoption of Digital Public Infrastructure, Artificial Intelligence-based credit assessment and digital lending mechanisms can contribute to a more inclusive financing environment. However,

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

the effectiveness of these mechanisms also depends on data security, technological accessibility, transparency and responsible lending practices.

Summary of Hypothesis Testing

Particulars	***Hypothesis 1***	***Hypothesis 2***
Sample size	100	100
Calculated Chi-Square	16.67	16.00
Degree of freedom	1	1
Critical value (5%)	3.841	3.841
Decision	Reject H□	Reject H□
Result	***Significant association***	***Significant association***

Overall Findings of Chi-Square Analysis

The Chi-Square analysis produces the following major findings:

1. FinTech adoption demonstrates a statistically significant positive association with formal credit accessibility among MSMEs.

2. Digital transaction records and alternative financial information can support improved creditworthiness assessment by financial institutions.

3. Greater awareness and adoption of Digital Public Infrastructure and technology-driven lending mechanisms are associated with favourable perceptions of inclusive MSME financing.

4. Artificial Intelligence-based credit assessment and digital lending platforms offer opportunities to improve the efficiency and accessibility of institutional financing.

5. Effective implementation requires appropriate regulatory safeguards, data protection, digital literacy and transparency in automated credit assessment.

Overall Conclusion of Hypothesis Testing

Both hypotheses demonstrate statistically significant associations between the selected variables at the 5% level of significance. The results support the argument that FinTech-enabled financial services and digital financial infrastructure have an important role in transforming MSME financing in India.

The analysis reinforces the need to integrate digital transaction records, alternative data, Account Aggregator frameworks and Artificial Intelligence-based credit assessment into the formal lending ecosystem. Such integration can potentially reduce information asymmetry and improve the accessibility of institutional finance for smaller enterprises.

Important methodological note: Since the actual questionnaire responses have not been provided, the frequencies used in Tables 1 and 2 are illustrative calculations to demonstrate the Chi-Square procedure. They must be replaced with actual survey responses before presenting the results as empirical findings in a submitted research paper. Also, the second test measures favourable perceptions, not actual improvements in sustainable financing. The tests establish association, not causation.

Challenges of FinTech-Enabled MSME Financing in India

1. Data Privacy and Security Concerns

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

The increasing use of digital transaction records, Account Aggregators and alternative data creates concerns regarding the privacy and security of MSME financial information. Financial institutions collect and process sensitive business data for credit assessment, making enterprises vulnerable to data breaches, unauthorised access and misuse of information. Small businesses may also lack adequate cybersecurity infrastructure to protect their digital records. Therefore, ensuring informed consent, secure data sharing, encryption and compliance with applicable data protection regulations remains essential for developing trust in digital lending systems.

2. Digital Literacy and Technological Adoption

Limited digital literacy and inadequate technological awareness create significant barriers to the adoption of FinTech-enabled financial services among MSMEs. Many small enterprises, particularly those operating in rural and semi-urban areas, may lack the technical knowledge required to use digital payment platforms, online lending applications and Account Aggregator services. Inadequate internet connectivity, limited access to digital devices and language barriers further restrict adoption. Consequently, enterprises may remain dependent on traditional financial practices, reducing the potential benefits of technology-driven credit assessment and digital financial inclusion.

3. Reliability and Availability of Alternative Data

Alternative data-based credit assessment depends on the availability, accuracy and consistency of digital transaction records and other financial information. However, many MSMEs operate partially through cash transactions or maintain incomplete digital records, making it difficult for lenders to develop comprehensive credit profiles. Inaccurate, outdated or fragmented information may also affect the reliability of credit scoring mechanisms. Furthermore, enterprises with limited digital transaction histories may receive lower credit assessments despite having genuine repayment capacity. Therefore, improving data quality and developing inclusive assessment models remain important challenges.

4. Algorithmic Bias and Transparency in Credit Assessment

The increasing application of Artificial Intelligence and machine learning in credit evaluation creates challenges relating to algorithmic bias and transparency. Automated credit scoring systems may produce unfair lending decisions when the underlying datasets contain historical inequalities or incomplete business information. Small enterprises, particularly those belonging to underserved geographical and economic segments, may face disadvantages due to such biases. Additionally, borrowers may not understand the reasons behind loan rejection or lower credit scores. Transparent algorithms, regular model evaluation, human oversight and effective grievance redressal mechanisms are necessary to ensure fair and accountable credit decisions.

5. Regulatory Coordination and Integration of Digital Infrastructure

The integration of digital lending platforms, Account Aggregators, banks, FinTech companies and other financial institutions requires effective regulatory coordination and technological interoperability. Differences in digital systems, data-sharing practices and operational standards may create difficulties in exchanging financial information. Moreover, regulatory uncertainties, compliance costs and the possibility of irresponsible lending can affect the sustainability of digital credit services. Smaller enterprises may also face difficulties in navigating complex digital lending procedures. Therefore, a coordinated regulatory framework, standardised data-sharing mechanisms and responsible lending practices are essential for strengthening the MSME financing ecosystem in India.

Remedies for Challenges in FinTech-Enabled MSME Financing in India

1. Strengthening Data Privacy and Cybersecurity

Financial institutions and FinTech companies should implement robust data protection and cybersecurity mechanisms to safeguard sensitive financial information of MSMEs. Secure encryption technologies, multi-factor authentication, regular security audits and controlled access to financial records should be adopted. Account Aggregator platforms must ensure that financial information is shared only with the informed consent of enterprises. Furthermore, awareness programmes should educate MSME owners about secure digital transactions, data protection practices and their rights under applicable data protection laws. These measures can strengthen confidence in digital lending and encourage greater participation in technology-driven financial services.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

2. Promoting Digital Literacy and Technological Adoption

Government authorities, financial institutions and industry associations should organise digital literacy and financial awareness programmes for MSME owners. Training should focus on digital payments, online banking, digital lending applications, Account Aggregator services and financial record management. Special attention should be given to enterprises operating in rural and semi-urban regions. Providing affordable internet connectivity, accessible digital platforms and multilingual technological support can further improve adoption. Collaboration between banks, FinTech companies and MSME development institutions can help enterprises understand digital financial services and utilise technology effectively for accessing formal credit.

3. Improving the Quality and Availability of Alternative Data

Financial institutions should develop comprehensive credit assessment frameworks that integrate multiple sources of financial and operational information. Digital payment histories, bank statements, GST records, invoice information, utility payments and business transaction records can provide additional insights into the financial position of MSMEs, subject to lawful access and consent. Special consideration should be given to enterprises with limited formal financial histories. Standardised data collection procedures, regular data verification and improved interoperability between financial platforms can enhance the reliability of alternative data and support more accurate creditworthiness assessments.

4. Ensuring Transparency and Fairness in AI-Based Credit Assessment

Banks and FinTech lending platforms should adopt transparent and accountable Artificial Intelligence-based credit assessment systems. Credit scoring algorithms must be regularly evaluated to identify discriminatory outcomes, inaccurate predictions and potential biases. Financial institutions should provide clear explanations for loan approvals, rejections and credit scoring decisions. Human intervention should remain available in cases involving complex or disputed assessments. Establishing effective grievance redressal mechanisms, independent algorithmic audits and responsible AI governance practices can improve fairness, accountability and trust in automated credit evaluation systems.

5. Strengthening Regulatory Coordination and Digital Infrastructure

Regulatory authorities should promote better coordination among banks, FinTech companies, Account Aggregators and other financial service providers. Standardised technological protocols and secure data-sharing arrangements can improve interoperability and reduce operational difficulties. The regulatory framework should encourage responsible digital lending, transparent interest rate disclosures, fair recovery practices and effective consumer protection. Furthermore, government institutions should support the development of accessible Digital Public Infrastructure and provide appropriate guidance to smaller enterprises. Regular monitoring, regulatory supervision and industry collaboration can strengthen the credibility, efficiency and sustainability of India's digital MSME financing ecosystem.

V. CONCLUSION

The study examines the role of FinTech-enabled financial services in transforming MSME financing in India, with particular emphasis on alternative data, Account Aggregator frameworks and Digital Public Infrastructure. MSMEs play a significant role in economic development; however, limited access to formal and affordable credit continues to restrict their growth and financial sustainability. Traditional credit assessment mechanisms, which primarily depend on collateral, financial statements and established credit histories, often create difficulties for small and emerging enterprises.

The review highlights that digital payment systems, alternative data-based credit assessment, digital lending platforms and Artificial Intelligence provide new opportunities to improve credit accessibility. Digital transaction records can help financial institutions understand business cash flows, evaluate repayment capacity and reduce information asymmetry. Similarly, Account Aggregator frameworks facilitate consent-based financial data sharing, while Digital Public Infrastructure supports the integration of financial services and technological platforms.

However, the successful implementation of these mechanisms depends on addressing several challenges, including data privacy, cybersecurity, digital literacy, algorithmic bias, data reliability and regulatory coordination. The study

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

emphasises that technological advancement alone cannot guarantee financial inclusion unless MSMEs possess the necessary digital capabilities and financial institutions adopt transparent and responsible lending practices.

It can therefore be concluded that the transition from digital transactions to formal credit represents an important opportunity for strengthening India's MSME financing ecosystem. Greater collaboration among government authorities, banks, FinTech companies and MSME associations is essential to improve the effectiveness of digital financial infrastructure. A responsible, transparent and inclusive approach to technology-driven lending can enhance formal credit accessibility, encourage entrepreneurship and contribute towards sustainable economic development in India.

REFERENCES

1. Asian Development Bank Institute. (2024). Open banking systems for enhancing financial access for micro, small, and medium-sized enterprises: The case of India. https://doi.org/10.56506/OKNA5983

2. Badola, S., & Mukherjee, S. (2021). Factors influencing access to formal credit of unincorporated enterprises in India. Prajnan, 49(4).

3. Beck, T., & Demirgüç-Kunt, A. (2006). Small and medium-size enterprises: Access to finance as a growth constraint. Journal of Banking & Finance, 30(11), 2931–2943. https://doi.org/10.1016/j.jbankfin.2006.05.009

4. Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2005). Financial and legal constraints to growth: Does firm size matter? The Journal of Finance, 60(1), 137–177. https://doi.org/10.1111/j.1540-6261.2005.00727.x

5. Berg, T., Burg, V., Gombović, A., & Puri, M. (2020). On the rise of FinTechs: Credit scoring using digital footprints. The Review of Financial Studies, 33(7), 2845–2897. https://doi.org/10.1093/rfs/hhz099

6. Berger, A. N., & Udell, G. F. (2006). A more complete conceptual framework for SME finance. Journal of Banking & Finance, 30(11), 2945–2966. https://doi.org/10.1016/j.jbankfin.2006.05.008

7. Carrière-Swallow, Y., Haksar, V., & Patnam, M. (2021). India's approach to open banking: Some implications for financial inclusion (IMF Working Paper No. 2021/052). International Monetary Fund. https://doi.org/10.5089/9781513570686.001

8. Dhanecha, H., & Rao, R. (2026). Digital lending: The future of MSME credit in India. Artha: Journal of Business and Finance, 2(1), 23–28. https://artha.iimcal.ac.in/index.php/artha/article/view/4

9. Hardik, N. (2024). Digitalisation promotes adoption of soft information in SME credit evaluation: The case of Indian banks. Digital Finance, 6, 23–54. https://doi.org/10.1007/s42521-023-00078-w

10. Hussain, M. A., & Tyagi, M. (2025). Political connections and credit access: Evidence from small businesses and microenterprises in India. Small Business Economics, 64, 1463–1491. https://doi.org/10.1007/s11187-024-00950-y

11. Jagtiani, J., & Lemieux, C. (2019). The roles of alternative data and machine learning in FinTech lending: Evidence from the LendingClub consumer platform. Financial Management, 48(4), 1009–1029. https://doi.org/10.1111/fima.12295

12. Jain, R., & Biswas, S. (2024). Can ICT make small beautiful? Examining the role of ICT in affecting the credit behavior of SMEs in India (ADBI Working Paper No. 1459). Asian Development Bank Institute. https://doi.org/10.56506/TXHU6941

13. Kadam, A., Singh, P., & Chatterjee, J. (2024). Does the owner's caste affect access to credit for enterprises in India's unorganized sector? Applied Economics Letters, 31(14), 1310–1315. https://doi.org/10.1080/13504851.2023.2186346

14. Kapoor, R., & Goyal, T. M. (2024). Open banking systems for enhancing financial access for micro, small, and medium-sized enterprises: The case of India. Asian Development Bank Institute. https://doi.org/10.56506/OKNA5983

15. Mukherjee, R. (2025). Intermediation of lending: Platforms, mobile money, and data transactions in India. Finance and Society. https://doi.org/10.1177/29768624251339752

16. Nair, G. S., & Gopal, N. (2024). Credit access towards MSMEs: An investigation of banker's perspectives. SEDME (Small Enterprises Development, Management & Extension Journal, 51(2). https://doi.org/10.1177/09708464241247874

17. Nikaido, Y., Pais, J., & Sarma, M. (2015). What hinders and what enhances small enterprises' access to formal credit in India? Review of Development Finance, 5(1), 43–52. https://doi.org/10.1016/j.rdf.2015.05.002

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

18. Philippon, T. (2016). The FinTech opportunity (NBER Working Paper No. 22476). National Bureau of Economic Research. https://doi.org/10.3386/w22476

19. Reserve Bank of India. (2016). Master direction—Non-banking financial company—Account Aggregator (Reserve Bank) directions, 2016. https://www.rbi.org.in/

20. Reserve Bank of India. (2021). Report of the Working Group on digital lending including lending through online platforms and mobile apps. Reserve Bank of India. https://www.rbi.org.in/