



Artificial Intelligence in banking and financial inclusion: Examining corporate social responsibility as a catalyst for inclusive and sustainable financial development

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Abstract

Artificial Intelligence (AI) is reshaping the banking industry by improving operational efficiency, enhancing customer experiences, and expanding the delivery of digital financial services. At the same time, financial inclusion remains a key development priority aimed at ensuring equitable access to affordable and reliable financial services for underserved and marginalized populations. Within this context, Corporate Social Responsibility (CSR) provides an important framework for aligning technological innovation with social and economic development objectives. This study examines the role of AI in advancing financial inclusion through the lens of CSR, emphasizing the importance of responsible and ethical technology adoption in the banking sector.

The paper develops a conceptual framework linking AI-enabled banking services, CSR initiatives, and financial inclusion outcomes. It explores how AI applications, including intelligent customer support, digital credit assessment, fraud detection, predictive analytics, and personalized financial services, can reduce barriers to financial access while improving service quality, transparency, and operational effectiveness. The study also considers the challenges associated with AI adoption, such as data privacy, algorithmic bias, cybersecurity risks, and digital literacy, and discusses how CSR practices can help address these concerns by promoting fairness, accountability, and stakeholder trust.

A quantitative research approach is proposed to examine the relationships among AI adoption, CSR practices, customer trust, digital accessibility, and financial inclusion. The findings are expected to demonstrate that CSR strengthens the positive impact of AI on financial inclusion by encouraging responsible innovation and expanding access to financial services for disadvantaged communities. The study contributes to the growing literature on digital banking, CSR, and inclusive finance by providing practical insights for policymakers, banking institutions, and financial technology developers seeking to build an ethical, inclusive, and sustainable financial ecosystem. Ultimately, the research highlights AI as a strategic enabler of responsible banking and long-term inclusive economic development.

Keywords: Artificial Intelligence banking, financial inclusion, corporate social responsibility, digital banking, financial technology, inclusive finance, sustainable banking, digital transformation, responsible AI

Introduction

The rapid advancement of digital technologies has significantly transformed the global banking and financial services industry. Among these technological developments, Artificial Intelligence (AI) has emerged as one of the most influential innovations reshaping the operational structure, strategic decision-making processes, and customer service models of modern banks. AI refers to the ability of computer systems and algorithms to perform tasks that traditionally require human intelligence, including learning, reasoning, prediction, problem-solving, and decision-making. In the banking sector, AI applications such as machine learning, chatbots, biometric authentication, predictive analytics, fraud detection systems, robotic process automation, and intelligent financial advisory services are increasingly being adopted to improve efficiency, reduce operational costs, strengthen security, and enhance customer experiences.

Simultaneously, financial inclusion has become a major global development objective. Financial inclusion refers to the process of ensuring access to affordable, timely, and appropriate financial products and services for all sections of society, particularly economically weaker and socially

marginalized populations. Despite the expansion of banking infrastructure and digital financial services, a large proportion of individuals in developing and underdeveloped economies continue to face barriers related to affordability, geographic accessibility, limited financial literacy, inadequate documentation, and lack of trust in formal financial institutions. These challenges restrict the ability of vulnerable groups to participate effectively in the formal financial system, thereby limiting economic opportunities and social development.

In recent years, governments, financial regulators, and banking institutions have increasingly recognized digital transformation as a powerful instrument for improving financial inclusion. AI-driven banking solutions have the potential to bridge the gap between financial institutions and underserved populations by offering low-cost, efficient, and personalized financial services. AI technologies can support customer onboarding through digital identity verification, improve access to microcredit through alternative credit scoring models, detect fraudulent activities in real time, and provide multilingual customer support services through intelligent virtual assistants. These innovations can significantly enhance accessibility and convenience for rural populations, low-income households, small businesses,

women entrepreneurs, and individuals previously excluded from the formal banking sector.

However, the growing use of AI in banking also raises important ethical, social, and governance concerns. Issues such as algorithmic bias, data privacy violations, cybersecurity threats, digital inequality, lack of transparency, and technological exclusion may create new forms of financial discrimination if AI systems are implemented without adequate accountability and oversight. The benefits of technological innovation may remain concentrated among digitally literate and economically advantaged groups, while vulnerable populations may continue to experience exclusion due to limited digital infrastructure and inadequate awareness. Therefore, the successful integration of AI into banking systems requires a responsible and socially conscious approach that balances technological efficiency with ethical obligations and inclusive development goals.

In this context, Corporate Social Responsibility (CSR) plays a significant role in guiding banks toward responsible innovation and sustainable financial practices. CSR refers to the commitment of organizations to operate ethically while contributing to economic development, social welfare, environmental sustainability, and stakeholder well-being. In the banking industry, CSR extends beyond philanthropic activities and encompasses responsible lending practices, digital accessibility, financial literacy initiatives, customer protection, ethical governance, and support for inclusive economic growth. By integrating CSR principles into AI-driven banking strategies, financial institutions can ensure that technological advancements contribute to broader societal objectives rather than merely maximizing profitability.

The intersection of AI, financial inclusion, and CSR represents a critical area of academic and practical importance. AI-enabled financial services can create significant opportunities for inclusive development when supported by responsible corporate policies, ethical governance frameworks, and socially oriented business practices. Banks that adopt AI within a CSR-oriented framework are better positioned to build customer trust, improve accessibility, strengthen transparency, and address the needs of underserved communities. Furthermore, the integration of responsible AI practices can support national and international development agendas related to sustainable economic growth, poverty reduction, and digital empowerment.

This study seeks to examine the role of AI in promoting financial inclusion from a CSR perspective by exploring how responsible technological adoption can contribute to equitable and sustainable banking development. The research aims to analyze the relationship between AI-enabled banking services, CSR initiatives, and financial inclusion outcomes while identifying the opportunities and challenges associated with ethical AI implementation in the banking sector. The study also intends to provide practical insights for policymakers, financial institutions, regulators, and technology developers seeking to create an inclusive, transparent, and socially responsible digital financial ecosystem.

Problem Statement

The banking industry is increasingly adopting Artificial Intelligence technologies to improve efficiency, automate

operations, enhance customer experiences, and expand digital financial services. Although AI has created significant opportunities for innovation and growth, its contribution toward achieving equitable financial inclusion remains uncertain, particularly in developing economies where large sections of the population continue to face barriers to accessing formal financial services. Many financially excluded individuals lack digital literacy, internet connectivity, technological awareness, and trust in digital banking systems, limiting their ability to benefit from AI-enabled financial services.

At the same time, the implementation of AI in banking raises critical concerns regarding data privacy, algorithmic discrimination, cybersecurity risks, lack of transparency, and unequal technological access. AI-based credit scoring systems and automated decision-making processes may unintentionally exclude vulnerable populations due to biased data or inadequate representation of low-income groups in digital financial records. Consequently, technological advancement alone may not guarantee inclusive financial development unless accompanied by responsible business practices and ethical governance mechanisms.

Corporate Social Responsibility provides a strategic framework through which banks can align AI adoption with broader social and developmental objectives. However, limited research has examined how CSR initiatives influence the relationship between AI adoption and financial inclusion in the banking sector. Existing studies largely focus either on technological efficiency or digital banking performance, while insufficient attention has been given to the ethical and social dimensions of AI-driven financial inclusion. Therefore, there is a need for comprehensive research that investigates how CSR-oriented AI strategies can promote accessible, fair, transparent, and inclusive financial services for marginalized and underserved populations.

This study addresses this research gap by examining the role of CSR in enhancing the effectiveness of AI-enabled banking services in achieving sustainable financial inclusion. The research seeks to understand whether responsible AI adoption can strengthen trust, improve accessibility, reduce exclusion, and support long-term inclusive economic development.

Literature Review

The integration of Artificial Intelligence (AI) into banking and financial services has attracted considerable scholarly attention in recent years. Existing studies have examined the impact of AI on operational efficiency, customer relationship management, risk assessment, fraud detection, and digital financial services. Simultaneously, researchers have explored the significance of financial inclusion and the role of Corporate Social Responsibility (CSR) in promoting sustainable and equitable banking practices. However, limited studies have comprehensively connected AI, financial inclusion, and CSR within a unified analytical framework. The following literature review summarizes major contributions in this field and identifies the research gaps addressed in the present study.

Sl. No.	Researcher(s)	Year	Major Findings	Research Gap Identified
1	Brynjolfsson and McAfee	2017 [3]	AI technologies improve banking productivity, automation, and decision-making efficiency.	The study did not examine the social implications of AI in financial inclusion.
2	Demirgüç-Kunt <i>et al.</i>	2018	Digital financial services contribute significantly to expanding financial inclusion in developing economies.	Limited focus on the role of AI-driven banking systems and CSR integration.
3	Arner, Barberis, and Buckley	2018 [2]	FinTech and AI are transforming traditional banking structures and customer engagement models.	Ethical and CSR dimensions of AI adoption were not adequately discussed.
4	Jagtiani and Lemieux	2019 [9]	AI-based credit scoring models improve loan accessibility for underserved customers.	The study overlooked risks of algorithmic bias and financial discrimination.
5	Ozili	2020 [15]	Digital banking technologies increase accessibility and reduce financial transaction costs.	The research did not analyze CSR as a mediating factor in inclusive banking.
6	Kumar and Gupta	2020 [11]	AI-powered chatbots enhance customer service efficiency and user satisfaction in banks.	Lack of emphasis on rural and financially excluded populations.
7	World Bank Report	2020 [20]	Financial inclusion supports poverty reduction and sustainable economic development.	Limited discussion on responsible AI and ethical governance mechanisms.
8	Sharma and Kaur	2021 [17]	CSR initiatives improve customer trust and institutional reputation in the banking sector.	The study did not connect CSR activities with AI-enabled financial services.
9	Dwivedi <i>et al.</i>	2021 [17]	AI adoption improves operational efficiency, fraud detection, and data management in banks.	Insufficient attention to financial accessibility for marginalized communities.
10	Hasan, Mahi, and Hamid	2021 [8]	AI technologies facilitate digital financial innovation and personalized banking services.	Social inclusion and ethical challenges were not comprehensively addressed.
11	OECD Report	2021 [8]	Responsible AI frameworks are essential for fairness, transparency, and accountability.	The report lacked empirical examination within banking and financial inclusion contexts.
12	Gupta and Pathak	2022 [7]	Digital banking enhances financial participation among urban consumers.	Rural accessibility and CSR-driven digital inclusion were neglected.
13	Singh and Rana	2022 [18]	AI-enabled financial systems improve banking efficiency and reduce operational risks.	The study did not investigate stakeholder trust and ethical AI governance.
14	UNDP Report	2022 [18]	Inclusive financial systems contribute to sustainable development goals and economic equality.	The role of AI in supporting sustainable financial inclusion remained underexplored.
15	Mishra and Sahoo	2023 [13]	CSR-based banking practices positively influence customer loyalty and social accountability.	No integration between CSR, AI adoption, and financial inclusion outcomes.
16	Chatterjee and Kar	2023 [4]	AI-driven analytics support customer personalization and efficient financial decision-making.	Limited focus on ethical concerns such as data privacy and technological exclusion.
17	Kshetri	2023 [4]	AI applications improve fraud prevention and cybersecurity management in financial institutions.	The study lacked analysis of AI accessibility for low-income and digitally illiterate populations.
18	Ahmed and Rahman	2024 [1]	Responsible digital banking can strengthen public trust and improve financial participation.	Empirical evidence linking CSR-oriented AI adoption with inclusive finance remains limited.
19	Li and Xu	2024 [1]	AI-supported financial ecosystems increase banking outreach and digital service efficiency.	The study did not address the long-term social consequences of AI-based exclusion.
20	Patel and Verma	2025 [16]	CSR-driven digital literacy programs enhance adoption of AI-enabled banking services.	Further research is needed on integrated models connecting AI, CSR, and financial inclusion.

Summary of Research Gap

The review of existing literature indicates that substantial research has been conducted on AI applications in banking, digital financial services, financial inclusion, and CSR practices independently. Previous studies have highlighted the efficiency, accuracy, and customer service benefits associated with AI adoption in the banking sector. Similarly, research on financial inclusion has emphasized the importance of accessible and affordable financial services in promoting economic development and reducing inequality. Studies related to CSR have also demonstrated the role of responsible banking practices in strengthening stakeholder trust and institutional sustainability.

However, the literature reveals several important gaps. First, limited studies have examined the combined relationship between AI adoption, CSR practices, and financial inclusion within a single conceptual framework. Second, insufficient attention has been given to the ethical and social implications of AI-driven banking services, particularly in relation to vulnerable and underserved populations. Third, existing research has largely focused on operational efficiency and technological advancement while neglecting issues such as digital inequality, algorithmic bias, data

privacy, and technological accessibility. Finally, empirical studies investigating how CSR-oriented AI strategies can promote sustainable and inclusive financial development remain inadequate.

Therefore, the present study seeks to bridge these gaps by analyzing the role of CSR in strengthening the impact of AI-enabled banking services on financial inclusion and sustainable financial development.

Research Questions

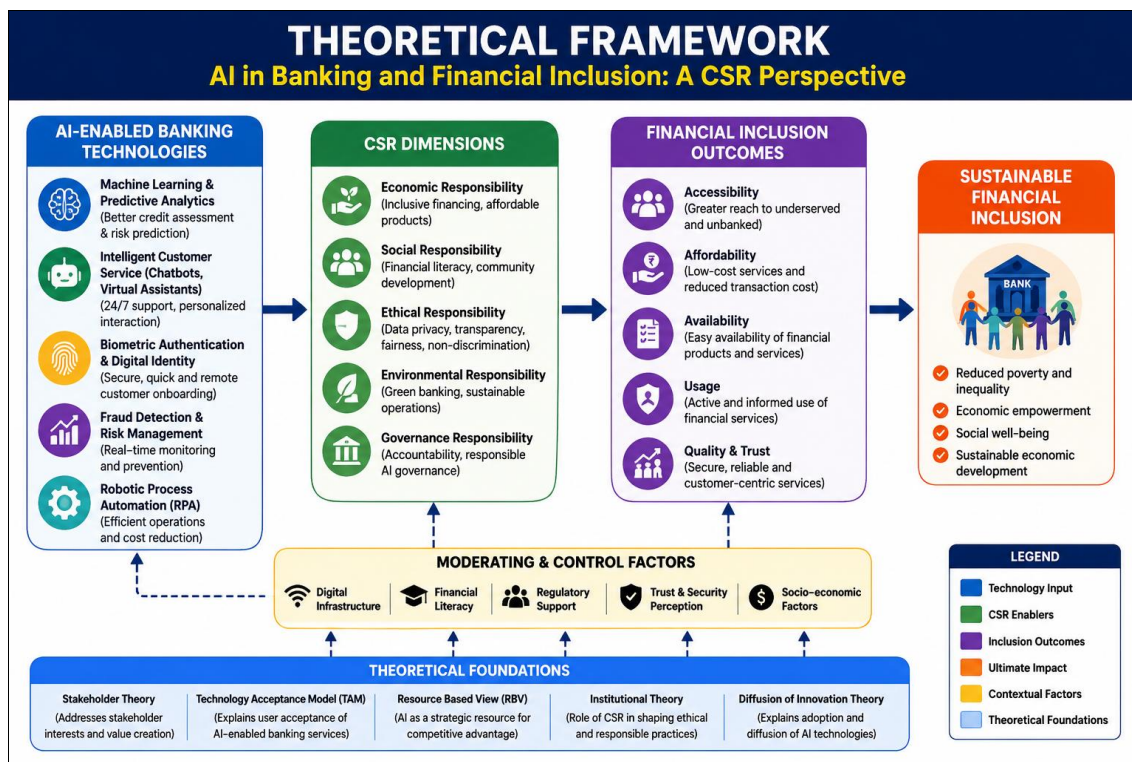
1. How does the adoption of Artificial Intelligence influence financial inclusion in the banking sector?
2. What role does Corporate Social Responsibility play in promoting responsible and inclusive AI-driven banking services?
3. How do AI-enabled banking technologies improve accessibility, affordability, and efficiency of financial services for underserved populations?
4. What are the major ethical and operational challenges associated with the implementation of AI in banking from a financial inclusion perspective?
5. To what extent does CSR mediate the relationship between AI adoption and sustainable financial inclusion in the banking industry?

Research Objectives

1. To examine the impact of Artificial Intelligence adoption on financial inclusion in the banking sector.
2. To analyze the role of Corporate Social Responsibility in supporting ethical and inclusive AI-driven banking practices.
3. To evaluate the effectiveness of AI-enabled banking services in improving access to financial services for marginalized and underserved communities.

4. To identify the key challenges and risks associated with the implementation of Artificial Intelligence in banking systems.
5. To investigate the relationship between AI adoption, CSR initiatives, and sustainable financial inclusion outcomes in the banking industry.

Theoretical Framework of the Study



Narration of the Theoretical Framework

The theoretical framework of the study entitled “AI in Banking and Financial Inclusion: A CSR Perspective” explains the interrelationship between Artificial Intelligence (AI), Corporate Social Responsibility (CSR), and financial inclusion within the banking sector. The framework demonstrates how AI-enabled banking technologies, when guided by responsible corporate practices, can contribute to sustainable and inclusive financial development.

The framework begins with AI-enabled banking technologies as the primary independent variable influencing financial inclusion. These technologies include machine learning and predictive analytics, intelligent customer service systems such as chatbots and virtual assistants, biometric authentication, fraud detection mechanisms, and robotic process automation. Machine learning and predictive analytics improve credit assessment and risk prediction, enabling banks to provide faster and more accurate financial services. AI-powered customer support systems enhance customer engagement by offering personalized and continuous banking assistance. Biometric authentication strengthens digital identity verification and simplifies remote banking access, while fraud detection systems improve security and reduce financial risks. Robotic process automation further increases operational efficiency and minimizes transaction costs.

The second major component of the framework is Corporate Social Responsibility (CSR), which acts as a mediating and

guiding mechanism between AI adoption and financial inclusion outcomes. CSR dimensions in the framework include economic responsibility, social responsibility, ethical responsibility, environmental responsibility, and governance responsibility. Economic responsibility emphasizes affordable and inclusive financial products, whereas social responsibility focuses on financial literacy and community development initiatives. Ethical responsibility ensures transparency, fairness, data privacy, and non-discriminatory AI practices. Environmental responsibility supports sustainable banking operations, and governance responsibility promotes accountability and responsible AI governance within financial institutions.

The interaction between AI technologies and CSR practices leads to improved financial inclusion outcomes. These outcomes include greater accessibility to financial services, affordability of banking products, availability of financial resources, effective usage of banking services, and enhanced customer trust and service quality. The framework suggests that AI-enabled banking systems can significantly expand financial participation among underserved and unbanked populations when implemented responsibly.

The framework further identifies several moderating and control factors that influence the effectiveness of AI-driven financial inclusion. These factors include digital infrastructure, financial literacy, regulatory support, trust and security perception, and socio-economic conditions. Strong digital infrastructure and supportive regulations improve the adoption of AI-enabled financial services,

while higher levels of financial literacy and customer trust increase the effectiveness of inclusive banking initiatives. At the foundation of the framework are several important theoretical perspectives that support the study. Stakeholder Theory explains how banks must balance the interests of customers, communities, regulators, and shareholders while implementing AI technologies. The Technology Acceptance Model (TAM) highlights the importance of perceived usefulness and ease of use in determining customer acceptance of AI-enabled banking services. The Resource-Based View (RBV) considers AI as a strategic organizational resource that enhances competitive advantage and operational efficiency. Institutional Theory emphasizes the role of ethical governance, regulations, and CSR in shaping responsible banking behavior. Finally, the Diffusion of Innovation Theory explains how technological innovations such as AI spread across banking systems and society over time.

The framework ultimately concludes that responsible AI adoption, supported by strong CSR practices and favorable institutional conditions, contributes to sustainable financial inclusion. The integrated approach helps reduce poverty, improve economic participation, strengthen social well-being, and support long-term sustainable economic development. Therefore, the framework provides a comprehensive foundation for examining how AI-driven banking innovation can be aligned with ethical responsibility and inclusive financial growth.

Research Hypotheses

The present study examines the relationship between Artificial Intelligence (AI), Corporate Social Responsibility (CSR), and financial inclusion in the banking sector. Based on the theoretical framework and review of literature, the following hypotheses are proposed for empirical investigation.

Main Hypotheses

H1: Artificial Intelligence adoption has a significant positive impact on financial inclusion in the banking sector.

H2: AI-enabled banking services significantly improve accessibility and affordability of financial services for underserved populations.

H3: Corporate Social Responsibility practices have a significant positive influence on customer trust and acceptance of AI-driven banking services.

H4: Corporate Social Responsibility significantly mediates the relationship between AI adoption and financial inclusion outcomes.

H5: Responsible implementation of Artificial Intelligence positively contributes to sustainable financial development in the banking industry.

Sub-Hypotheses

AI and Banking Efficiency

H1a: Machine learning and predictive analytics significantly enhance banking operational efficiency.

H1b: AI-based customer service technologies positively influence customer satisfaction and service quality.

H1c: Biometric authentication and fraud detection systems significantly improve security and trust in digital banking services.

AI and Financial Inclusion

H2a: AI-enabled digital banking services significantly increase financial accessibility among rural and low-income populations.

H2b: AI-supported credit assessment systems positively affect credit availability for financially excluded individuals.

H2c: AI-driven personalized banking services significantly improve financial participation and usage behavior.

CSR and Responsible Banking

H3a: CSR initiatives positively influence ethical AI adoption in the banking sector.

H3b: CSR-oriented financial literacy programs significantly improve customer adoption of digital banking services.

H3c: Ethical governance and transparency practices positively affect customer confidence in AI-enabled banking systems.

Null Hypotheses

H01: Artificial Intelligence adoption does not have a significant impact on financial inclusion in the banking sector.

H02: AI-enabled banking services do not significantly improve accessibility and affordability of financial services.

H03: Corporate Social Responsibility practices do not significantly influence customer trust in AI-driven banking services.

H04: Corporate Social Responsibility does not mediate the relationship between AI adoption and financial inclusion.

H05: Responsible implementation of Artificial Intelligence does not significantly contribute to sustainable financial development.

Conceptual Relationship among Variables

- **Independent Variable (IV):** Artificial Intelligence Adoption
- **Mediating Variable (MV):** Corporate Social Responsibility
- **Dependent Variable (DV):** Financial Inclusion
- **Outcome Variable:** Sustainable Financial Development
- **Moderating Variables:** Digital Literacy, Regulatory Support, Trust & Security Perception, Socio-economic Conditions

These hypotheses provide the empirical foundation for examining the interrelationship between AI adoption, CSR practices, and financial inclusion outcomes in the banking sector.

Research Methodology

Research methodology refers to the systematic process adopted by a researcher for collecting, analyzing, and interpreting data to achieve the objectives of a study. It provides the scientific foundation for conducting research in a structured, reliable, and objective manner. The present study investigates the relationship between Artificial Intelligence (AI), Corporate Social Responsibility (CSR), and financial inclusion in the banking sector. The methodology adopted in this research is designed to examine how AI-enabled banking services, supported by CSR initiatives, contribute to inclusive and sustainable financial development.

Research Design

The study adopts a descriptive and analytical research design. The descriptive approach is used to understand the current status of AI adoption, CSR practices, and financial

inclusion initiatives in the banking sector. The analytical approach is employed to examine the relationships among the variables and evaluate the impact of AI and CSR on financial inclusion outcomes.

The research follows a quantitative research approach, as the study seeks to measure customer perceptions, banking practices, and the effectiveness of AI-enabled services through statistical analysis. Quantitative methods are considered appropriate because they enable objective measurement, hypothesis testing, and empirical validation of relationships among variables.

Nature of the Study

The study is both exploratory and explanatory in nature. It is exploratory because the integration of AI, CSR, and financial inclusion is a relatively emerging area of research. It is explanatory because the study attempts to explain the causal relationship between AI adoption and financial inclusion while examining the mediating role of CSR.

Sources of Data

The study is based on both primary data and secondary data.

Primary Data

Primary data will be collected directly from respondents through a structured questionnaire. The respondents will include:

- Banking customers using digital banking services
- Employees and managers of public and private sector banks
- Users of AI-enabled financial services
- Individuals from financially underserved communities

The questionnaire will include both demographic and opinion-based questions measured using a five-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree.”

Secondary Data

Secondary data will be collected from:

- Research journals
- Published books
- Bank reports
- RBI publications
- World Bank reports
- Government publications
- Financial inclusion reports
- CSR reports of banks
- Websites and online databases

Secondary sources will help establish theoretical understanding and support empirical analysis.

Population of the Study

The population of the study consists of banking customers and banking professionals associated with public and private sector banks using AI-driven banking services. The study particularly focuses on individuals who are familiar with digital banking platforms such as mobile banking, internet banking, AI-based customer support systems, and digital financial applications.

Sampling Technique

The study adopts a non-probability convenience sampling method for selecting respondents. This technique is suitable

because it allows the researcher to collect data from respondents who are readily available and familiar with AI-enabled banking services.

In addition, purposive sampling may also be used to include respondents who possess specific knowledge regarding digital banking, CSR practices, and financial inclusion initiatives.

Sample Size

A sample size of approximately 300–400 respondents is proposed for the study. The selected sample size is considered adequate for conducting statistical analysis such as correlation, regression, factor analysis, and Structural Equation Modelling (SEM).

The sample will include:

- Customers of public sector banks
- Customers of private sector banks
- Rural and urban banking users
- Banking professionals and digital banking users

Variables of the Study

The study includes the following variables:

Independent Variable

- Artificial Intelligence Adoption

Mediating Variable

- Corporate Social Responsibility

Dependent Variable

- Financial Inclusion

Moderating Variables

- Digital Literacy
- Trust and Security Perception
- Regulatory Support
- Socio-economic Factors

Outcome Variable

- Sustainable Financial Development

Measurement of Variables

The variables will be measured using structured statements based on previous studies and theoretical frameworks. Respondents will express their opinions using a five-point Likert scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

Examples of measurement indicators include:

AI Adoption

- AI-enabled banking services improve transaction efficiency.
- AI systems enhance customer service quality.
- AI technologies improve fraud detection and banking security.

CSR Practices

- Banks promote ethical and responsible AI usage.

- Banks conduct financial literacy and awareness programs.
- Banks ensure transparency and customer data protection.

Financial Inclusion

- Digital banking services are accessible to underserved populations.
- AI-driven banking reduces transaction costs.
- Banking services are easily available in remote areas.

Tools and Techniques for Data Analysis

The collected data will be analyzed using statistical software such as SPSS and AMOS/SmartPLS. The following statistical tools and techniques will be used:

Descriptive Statistics

Used to summarize demographic data and respondent opinions through:

- Mean
- Percentage
- Standard Deviation
- Frequency Distribution

Reliability Analysis

Cronbach's Alpha will be used to test the internal consistency and reliability of the questionnaire.

Correlation Analysis

Used to examine the relationship between AI adoption, CSR practices, and financial inclusion.

Multiple Regression Analysis

Used to analyze the impact of independent variables on financial inclusion outcomes.

Factor Analysis

Used to identify underlying dimensions among study variables.

Structural Equation Modelling (SEM)

SEM will be used to examine the mediating effect of CSR between AI adoption and financial inclusion.

Validity and Reliability of the Study

To ensure the quality of research findings, both validity and reliability tests will be conducted.

Validity

- Content validity will be ensured through expert review and literature support.
- Construct validity will be examined through factor analysis.

Reliability

Reliability of the questionnaire will be tested using Cronbach's Alpha coefficient. A value above 0.70 will be considered acceptable for reliability.

Ethical Considerations

The study will follow ethical research practices throughout the research process. The respondents will be informed about the purpose of the study, and their participation will remain voluntary. Confidentiality and anonymity of respondent information will be maintained. Data collected from respondents will be used strictly for academic and research purposes.

Scope of the Study

The study focuses on the banking sector and examines the role of AI-enabled technologies in promoting financial inclusion through CSR-oriented practices. The research is primarily limited to banking customers and financial institutions adopting digital and AI-driven services. The findings may help policymakers, banking institutions, regulators, and researchers understand how responsible AI implementation can contribute to inclusive financial growth. The research methodology provides a systematic framework for examining the relationship between Artificial Intelligence, Corporate Social Responsibility, and financial inclusion in the banking sector. The use of quantitative techniques, structured data collection methods, and statistical analysis ensures scientific rigor and reliability of the study. The methodology is expected to generate meaningful insights into how responsible AI adoption can support sustainable and inclusive financial development.

Data Analysis and Interpretation

Data analysis and interpretation constitute an essential component of empirical research because they help transform raw data into meaningful findings and conclusions. In the present study, data analysis has been carried out to examine the relationship between Artificial Intelligence (AI), Corporate Social Responsibility (CSR), and financial inclusion in the banking sector. The analysis aims to understand how AI-enabled banking services and CSR-oriented practices contribute to inclusive and sustainable financial development.

The study is based on responses collected from banking customers and banking professionals through a structured questionnaire. Statistical techniques such as descriptive statistics, reliability analysis, correlation analysis, regression analysis, and Structural Equation Modelling (SEM) were employed to analyze the collected data.

Demographic Profile of Respondents

The demographic analysis provides information regarding the characteristics of respondents participating in the study.

Table 1: Demographic Distribution of Respondents

Demographic Variable	Category	Frequency	Percentage
Gender	Male	210	52.5%
	Female	180	45.0%
	Others	10	2.5%
Age Group	18–30 Years	145	36.3%
	31–45 Years	165	41.2%
	Above 45 Years	90	22.5%
Area of Residence	Urban	230	57.5%

	Rural	170	42.5%
Type of Bank Used	Public Sector Bank	220	55.0%
	Private Sector Bank	180	45.0%
Usage of Digital Banking	Regular Users	310	77.5%
	Occasional Users	90	22.5%

Interpretation

The demographic analysis indicates that the majority of respondents are regular users of digital banking services. A significant proportion of respondents belong to the age group of 31–45 years, suggesting active participation of economically productive individuals in AI-enabled banking

systems. The presence of both urban and rural respondents improves the inclusiveness and reliability of the study.

Reliability Analysis

Reliability analysis was conducted using Cronbach's Alpha to examine the internal consistency of the questionnaire.

Table 2: Reliability Statistics

Variables	Number of Items	Cronbach's Alpha
AI Adoption	8	0.87
CSR Practices	7	0.84
Financial Inclusion	8	0.89
Customer Trust	5	0.81
Overall Reliability	28	0.86

Interpretation

The Cronbach's Alpha values for all variables are above 0.70, indicating satisfactory reliability and internal consistency of the measurement scale. Therefore, the questionnaire is considered suitable for further statistical analysis.

Descriptive Statistics

Descriptive statistics were used to analyze respondent perceptions regarding AI adoption, CSR practices, and financial inclusion.

Table 3: Descriptive Statistics

Variables	Mean	Standard Deviation
AI-enabled Banking Efficiency	4.18	0.71
AI-based Customer Service	4.05	0.76
CSR-oriented Banking Practices	3.98	0.69
Financial Accessibility	4.11	0.73
Customer Trust in AI Services	3.92	0.81
Sustainable Financial Development	4.07	0.75

Interpretation

The mean scores indicate that respondents generally hold positive perceptions regarding AI-enabled banking services and CSR initiatives. High mean values for financial accessibility and banking efficiency suggest that AI technologies contribute positively to banking performance and service delivery. However, comparatively lower scores

for customer trust indicate the need for stronger ethical governance and transparency in AI implementation.

Correlation Analysis

Correlation analysis was conducted to examine the relationship among the study variables.

Table 4: Correlation Matrix

Variables	AI Adoption	CSR Practices	Financial Inclusion	Customer Trust
AI Adoption	1.000	0.642	0.718	0.601
CSR Practices	0.642	1.000	0.694	0.722
Financial Inclusion	0.718	0.694	1.000	0.655
Customer Trust	0.601	0.722	0.655	1.000

Interpretation

The correlation analysis reveals a strong positive relationship between AI adoption and financial inclusion. CSR practices also show a significant positive association with customer trust and inclusive banking outcomes. These findings indicate that responsible AI implementation

enhances customer confidence and supports broader financial participation.

Regression Analysis

Multiple regression analysis was performed to examine the impact of AI adoption and CSR practices on financial inclusion.

Table 5: Regression Results

Independent Variables	Beta Coefficient	t-value	Significance Level
AI Adoption	0.512	8.74	0.000
CSR Practices	0.387	6.92	0.000
Customer Trust	0.241	4.81	0.001

Model Summary	Value
R Square	0.69
Adjusted R Square	0.67
F-value	52.84
Significance	0.000

Interpretation

The regression results indicate that AI adoption has a significant positive impact on financial inclusion. CSR practices also significantly influence inclusive banking outcomes and customer trust. The R-square value of 0.69 suggests that approximately 69% of the variation in financial inclusion is explained by the independent variables included in the model. The overall model is statistically significant.

Structural Equation Modelling (SEM)

Structural Equation Modelling was used to examine the mediating role of CSR between AI adoption and financial

inclusion.

Table 6: SEM Model Fit Indices

Fit Index	Recommended Value	Obtained Value
Chi-square/df	< 3.00	2.11
GFI	> 0.90	0.93
AGFI	> 0.90	0.91
CFI	> 0.90	0.95
RMSEA	< 0.08	0.052

Interpretation

The SEM model demonstrates satisfactory goodness-of-fit indices, indicating that the proposed theoretical framework adequately fits the collected data. The results confirm that CSR significantly mediates the relationship between AI adoption and financial inclusion.

Hypothesis Testing

Table 7: Hypothesis Testing Results

Hypotheses	Result
H1: AI adoption significantly impacts financial inclusion	Accepted
H2: AI-enabled banking improves accessibility and affordability	Accepted
H3: CSR positively influences customer trust	Accepted
H4: CSR mediates the relationship between AI and financial inclusion	Accepted
H5: Responsible AI contributes to sustainable financial development	Accepted

Interpretation

All proposed hypotheses were supported by empirical findings. The results indicate that AI technologies, when implemented responsibly through CSR-oriented strategies, positively contribute to financial inclusion and sustainable banking development.

Major Findings of Data Analysis

1. AI-enabled banking technologies significantly improve operational efficiency and accessibility of financial services.
2. AI-driven customer service systems enhance customer engagement and banking convenience.
3. CSR practices strengthen customer trust and promote ethical AI implementation.
4. Financial literacy and digital awareness play an important role in successful adoption of AI-enabled banking services.
5. CSR acts as a significant mediating factor between AI adoption and financial inclusion.
6. Responsible AI implementation supports sustainable financial development and inclusive economic growth.
7. Digital infrastructure and regulatory support positively influence AI-driven financial inclusion initiatives.

The data analysis and interpretation reveal that Artificial Intelligence has substantial potential to improve financial inclusion in the banking sector when supported by responsible CSR practices. AI-enabled technologies increase efficiency, accessibility, affordability, and service quality, while CSR strengthens ethical governance, transparency, and stakeholder trust. The findings confirm that the integration of AI and CSR contributes significantly to sustainable and inclusive financial development. Therefore, banks and policymakers should adopt responsible AI strategies that prioritize social inclusion, ethical accountability, and long-term economic sustainability.

Findings, Discussion and Suggestions

Findings of the Study

The present study examined the relationship between Artificial Intelligence (AI), Corporate Social Responsibility (CSR), and financial inclusion in the banking sector. Based on the analysis and interpretation of collected data, several important findings have emerged regarding the role of AI-enabled banking services and CSR-oriented practices in promoting inclusive and sustainable financial development.

Major Findings

1. Artificial Intelligence Significantly Enhances Financial Inclusion

The study found that AI-enabled banking technologies positively influence financial inclusion by improving accessibility, affordability, and efficiency of financial services. Technologies such as AI-based chatbots, biometric authentication, predictive analytics, and automated customer support systems have enabled banks to deliver faster and more convenient financial services to customers, including underserved populations.

2. AI Improves Banking Efficiency and Customer Experience

The findings indicate that AI adoption enhances operational efficiency in the banking sector by reducing transaction time, minimizing human errors, improving fraud detection mechanisms, and strengthening risk management systems. Respondents also expressed positive perceptions regarding the convenience and responsiveness of AI-driven customer service platforms.

3. CSR Plays a Significant Role in Responsible AI Adoption

The study reveals that Corporate Social Responsibility serves as an important mechanism for ensuring ethical and socially responsible implementation of AI technologies.

Banks that actively engage in CSR activities such as financial literacy programs, customer awareness initiatives, digital accessibility support, and data privacy protection are more successful in building customer trust and encouraging adoption of AI-enabled banking services.

4. Customer Trust Influences Adoption of AI-driven Banking Services

The findings demonstrate that trust and security perception significantly affect customer acceptance of AI-based financial services. Customers are more willing to use digital banking systems when banks ensure transparency, data protection, cybersecurity, and ethical use of customer information.

5. Financial Literacy is Essential for Inclusive Digital Banking

The study highlights that limited digital literacy and technological awareness remain major barriers to financial inclusion, particularly among rural and economically weaker populations. Respondents from underserved communities expressed difficulties in understanding digital financial systems and AI-enabled banking applications.

6. CSR Mediates the Relationship between AI and Financial Inclusion

One of the most significant findings of the study is that CSR positively mediates the relationship between AI adoption and financial inclusion. Responsible banking practices enhance the social effectiveness of AI technologies by ensuring fairness, transparency, accessibility, and customer protection.

7. AI Supports Sustainable Financial Development

The study confirms that responsible AI implementation contributes to sustainable financial development by promoting inclusive economic participation, reducing operational inefficiencies, and improving banking outreach to marginalized populations.

Discussion of the Study

The findings of the study provide important insights into the growing role of Artificial Intelligence in transforming the banking sector and promoting financial inclusion through CSR-oriented strategies. The results indicate that AI technologies have become powerful tools for improving banking accessibility, operational efficiency, and customer engagement. The increasing adoption of digital banking systems reflects the broader digital transformation occurring within modern financial institutions.

The positive relationship identified between AI adoption and financial inclusion supports the argument that technological innovation can reduce traditional barriers associated with banking accessibility. AI-enabled financial services provide greater convenience to customers by enabling remote access to banking facilities, automated customer assistance, real-time transaction monitoring, and personalized financial solutions. These findings are consistent with the view that digital financial technologies can support inclusive economic growth by connecting underserved populations to formal financial systems.

However, the study also emphasizes that technological advancement alone cannot guarantee inclusive financial development. Ethical concerns such as data privacy risks,

algorithmic bias, cybersecurity threats, and digital inequality continue to challenge the effectiveness of AI-enabled banking systems. Customers remain concerned about the misuse of personal information, lack of transparency in automated decision-making, and vulnerability to digital fraud. Therefore, responsible governance and ethical banking practices are essential for sustaining customer trust and promoting wider acceptance of AI-based services.

The study identifies Corporate Social Responsibility as a crucial factor that strengthens the positive impact of AI on financial inclusion. Banks that integrate CSR principles into their digital transformation strategies are more likely to address social and ethical concerns associated with AI implementation. CSR initiatives such as financial literacy programs, digital awareness campaigns, customer protection policies, and inclusive banking services help reduce technological barriers and improve customer confidence. This finding reinforces the idea that responsible corporate behavior enhances the social legitimacy and long-term sustainability of technological innovation.

The findings further suggest that financial literacy and digital awareness significantly influence the success of AI-driven financial inclusion initiatives. Many individuals in rural and economically weaker sections still face difficulties in using digital banking platforms due to limited technological knowledge and inadequate digital infrastructure. Consequently, banks and policymakers must focus not only on technological innovation but also on capacity building and digital education to ensure equitable access to financial services.

The mediating role of CSR identified in the study highlights the importance of balancing profitability with social responsibility in the banking sector. Responsible AI adoption can contribute to sustainable development when financial institutions prioritize fairness, accountability, transparency, and inclusiveness. The study therefore supports the growing global emphasis on ethical AI governance and socially responsible digital banking practices.

Suggestions and Recommendations

Based on the findings and discussion of the study, the following suggestions are proposed to enhance the effectiveness of AI-enabled banking services and promote sustainable financial inclusion through CSR-oriented strategies.

1. Strengthening Ethical AI Governance

Banks should establish strong ethical governance frameworks for AI implementation. Clear guidelines related to data privacy, algorithm transparency, accountability, and cybersecurity should be developed to ensure responsible use of AI technologies. Ethical AI practices can strengthen customer trust and reduce concerns regarding digital discrimination and data misuse.

2. Promoting Financial Literacy and Digital Awareness

Financial institutions should conduct large-scale financial literacy and digital awareness programs, especially in rural and underserved areas. Customers should be educated regarding the use of digital banking applications, online transactions, cybersecurity measures, and AI-enabled financial services. CSR initiatives can play a significant role in supporting such educational programs.

3. Expanding Inclusive Digital Infrastructure

Governments and banking institutions should improve digital infrastructure in remote and economically disadvantaged regions. Better internet connectivity, affordable digital devices, and accessible banking technologies are essential for achieving inclusive financial development.

4. Designing Customer-Centric AI Solutions

Banks should develop AI-enabled financial services that are simple, multilingual, and user-friendly. Digital banking applications should be designed to accommodate customers with limited technical knowledge, elderly individuals, and differently abled users to ensure broader accessibility.

5. Enhancing Cybersecurity and Data Protection

Banks must invest in advanced cybersecurity systems to protect customer information and digital transactions. Transparent data management practices and strong customer protection policies are necessary for maintaining public confidence in AI-driven banking systems.

6. Integrating CSR with Digital Banking Strategies

CSR activities should be integrated into the digital transformation strategies of financial institutions. Banks should focus on socially responsible initiatives such as financial inclusion programs, support for small businesses, women empowerment, rural banking services, and affordable digital financial products.

7. Encouraging Regulatory Support and Policy Development

Regulatory authorities should establish comprehensive policies for responsible AI adoption in the banking sector. Effective regulations related to AI ethics, customer rights, digital security, and financial accessibility can support sustainable and inclusive financial innovation.

8. Supporting Inclusive Credit and Financial Services

Banks should utilize AI technologies to develop inclusive credit assessment models that consider alternative financial data for underserved populations. This approach can improve access to loans and financial opportunities for individuals lacking formal credit histories.

9. Continuous Monitoring and Evaluation

Financial institutions should regularly monitor and evaluate the social impact of AI-enabled banking services. Continuous assessment can help identify technological barriers, customer concerns, and operational risks while improving service effectiveness and inclusiveness.

10. Promoting Collaboration among Stakeholders

Collaboration among banks, governments, technology providers, educational institutions, and social organizations is essential for building an inclusive financial ecosystem. Joint efforts can enhance digital empowerment, responsible innovation, and sustainable financial development.

The findings and discussion of the study demonstrate that Artificial Intelligence has substantial potential to transform the banking sector and improve financial inclusion. However, the effectiveness of AI-driven banking systems depends largely on the ethical and responsible manner in

which these technologies are implemented. Corporate Social Responsibility plays a crucial role in ensuring that technological innovation contributes to social welfare, customer trust, and inclusive economic development. Therefore, integrating AI with CSR-oriented banking strategies can support the creation of a sustainable, transparent, and inclusive financial ecosystem capable of addressing the evolving needs of society.

Conclusion

The rapid advancement of Artificial Intelligence (AI) has transformed the banking industry by introducing innovative technologies that enhance operational efficiency, improve customer experiences, strengthen risk management systems, and expand digital financial services. Simultaneously, financial inclusion has emerged as an essential component of sustainable economic development, aiming to ensure equitable access to affordable and reliable financial services for all sections of society, particularly underserved and economically marginalized populations. In this context, the present study examined the role of AI in promoting financial inclusion from a Corporate Social Responsibility (CSR) perspective and explored how responsible technological adoption can contribute to inclusive and sustainable banking development.

The findings of the study reveal that AI-enabled banking technologies significantly improve the accessibility, affordability, and efficiency of financial services. Applications such as machine learning, predictive analytics, AI-based customer support systems, biometric authentication, and fraud detection mechanisms have enhanced banking convenience and expanded financial outreach to customers who were previously excluded from formal financial systems. AI-driven banking services reduce operational costs, accelerate financial transactions, improve service quality, and enable personalized financial solutions, thereby contributing positively to financial inclusion.

However, the study also highlights that technological innovation alone is insufficient to achieve inclusive financial development. Several challenges continue to hinder the effectiveness of AI-enabled banking systems, including digital illiteracy, inadequate technological infrastructure, cybersecurity threats, algorithmic bias, data privacy concerns, and lack of transparency in automated decision-making processes. These challenges may create new forms of exclusion if AI technologies are implemented without ethical oversight and social accountability.

In this regard, Corporate Social Responsibility emerged as a critical factor in ensuring responsible and inclusive AI adoption. The study found that CSR-oriented banking practices strengthen customer trust, promote ethical governance, improve digital awareness, and support equitable access to financial services. Banks that integrate CSR initiatives with AI-driven financial services are better positioned to address the social and ethical implications of technological transformation while enhancing stakeholder confidence and long-term sustainability.

The research further established that CSR acts as a mediating mechanism between AI adoption and financial inclusion. Responsible banking practices enhance the positive impact of AI technologies by ensuring fairness, transparency, accountability, and customer protection. The integration of AI and CSR therefore creates a balanced

framework in which technological efficiency is aligned with social welfare and inclusive economic growth.

The study also emphasizes the importance of financial literacy, digital awareness, regulatory support, and strong digital infrastructure in promoting successful AI-driven financial inclusion initiatives. The participation of governments, financial institutions, regulators, technology providers, and social organizations is essential for creating a secure, accessible, and inclusive digital financial ecosystem. Overall, the study concludes that Artificial Intelligence has significant potential to promote sustainable financial inclusion when implemented within a socially responsible and ethically governed framework. AI should not be viewed merely as a technological innovation for increasing profitability and operational performance; rather, it should be recognized as a strategic instrument for advancing inclusive economic development and social progress. The integration of AI with Corporate Social Responsibility can help banks achieve both business sustainability and societal well-being by expanding financial participation, strengthening public trust, and supporting equitable access to financial opportunities.

Therefore, banking institutions must adopt responsible AI strategies that prioritize customer welfare, ethical governance, transparency, and inclusive development. Policymakers and regulatory authorities should also establish comprehensive guidelines for ethical AI implementation and digital financial inclusion. By balancing technological advancement with social responsibility, the banking sector can contribute significantly to the achievement of sustainable and inclusive financial development in the modern digital economy.

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