

# JIM QUEST

*Journal of Management and Technology*

INDEX COPERNICUS  
INTERNATIONAL

 EBSCOhost

A Bi-annual Refereed Research Journal of Jaipuria Institute of Management, Indrapuram, Ghaziabad

---

**Impact of ESG Disclosure Quality on Firm Value: Evidence from Indian Listed Companies**

*Priyanka*

**Conversational AI in Social Sciences: A Bibliometric Study of Qualitative Research**

*Seema Singh, Devika Dabas*

**AI-Based Automation, Data Analytics Capability and Supply Chain Performance:  
An Empirical Study of Logistics Companies in Uttarakhand**

*Tushar Dhiman, Pankaj Madan*

**Mapping Technology Adoption and Digital Inclusion: A Bibliometric Analysis of  
Women-Led Self-Help Groups**

*Kiran Shoshta, Devesh Kumar*

**Artificial Intelligence in ESG-Based Microfinance: Promoting Sustainability among  
Women Entrepreneurs**

*Ramika Verma, Gargi Chaudhary*

**Gender Dimensions of Digital Financial Inclusion in India: Regulatory Frameworks  
and Global Perspectives**

*Ravi Rose, Babita Jha*

**AI-Driven Advertising and the Transformation of Consumer Decision-Making: A Bibliometric  
and Empirical Investigation**

*Saurabh Gupta, Vinitendra Pratap Singh*

**Humanizing Artificial Intelligence at Work: Integrating Workplace Spirituality and  
Human-AI Collaboration Research**

*Yanshika Gulati, Devesh Kumar*

---

— Accredited "A" Grade by NAAC —



JAIPURIA INSTITUTE  
OF MANAGEMENT

EMPOWER • ENTHUSE • EXCEL

INDRAPURAM, GHAZIABAD

— An Autonomous Institution —

**JAIPURIA INSTITUTE OF MANAGEMENT**  
Indrapuram, Ghaziabad

# JIM QUEST

Journal of Management and Technology

• Volume 22 • Issue No. 01 • January - June 2026

Special Issue on International Conference AIM-PEACE 2026

## Patrons

**Mr. Shishir Jaipuria**

Chairman

Jaipuria Group of Educational Institutions

**Prof. (Dr.) Daviender Narang**

Director

Jaipuria Institute of Management, Ghaziabad

## Chief Editor

**Prof. (Dr.) Anubha**

Research Head

Jaipuria Institute of Management, Ghaziabad

## Members - Editorial Board

**Dr. Ajay Tripathi**

*Jaipuria Institute of Management, Ghaziabad*

**Dr. Divya Pant**

*Jaipuria Institute of Management, Ghaziabad*

**Dr. Devi Archana Mohanty**

*Jaipuria Institute of Management, Ghaziabad*

**Dr. Abhishek Kumar**

*Jaipuria Institute of Management, Ghaziabad*

## Editorial Advisory Body

**Dr. D. P. Goyal**

*Director & Dean*

*LM Thapar School of Management, Chandigarh,  
Punjab*

**Prof. Bindu Gupta**

*Professor, IMT Ghaziabad, Delhi NCR*

**Prof. Jamal A Farooque**

*Professor, Aligarh Muslim University, Aligarh*

**Prof. Neera Verma**

*Deptt. of Economics, Gurugram University*

**Dr. Jitendra Kumar Mishra**

*Director, MIME*

**Prof.(Dr.) Ajay Pandit**

*Former Professor, FMS Delhi University,  
Delhi*

**Dr, Sheetal**

*IIM. Shillong*

**Disclaimer:** The responsibility of the contents and the opinions expressed in JIM QUEST, Journal of Management and Technology is exclusively of the author/s concerned. The publisher, editor or the institute shall not be held responsible for errors in the contents or any consequence arising from the use of content and information. The contents of this journal are primarily meant for academic purposes only.

### Address for Editorial Correspondence:

Chief Editor, JIM QUEST Journal of Management and Technology, Jaipuria Institute of Management, Ghaziabad, Block A Gate No 2, Shakti Khand - IV, Uttar Pradesh, India, 201014

Copyright © 2026 Jaipuria Institute of Management. All Rights reserved, reproducing any material published in JIM QUEST Journal of Management and Technology requires prior permission of chief editor.

# JIM QUEST

Journal of Management and Technology

---

• Volume 22 • Issue No. 01 • January - June 2026

Special Issue on International Conference AIM-PEACE 2026

---

The year 2026 marks a defining moment in the evolution of management thought and practice. As Artificial Intelligence (AI) increasingly permeates every aspect of organizational and societal life, the challenge before scholars, practitioners, policymakers, and educators is no longer whether AI will transform our world, but how this transformation can be guided toward human well-being, ethical accountability, and sustainable progress. It is in this spirit that the International Conference AIM-PEACE 2026 - AI in Management for People, Ethics, Accountability, Collaboration, and Enterprise - assumes profound significance.

Hosted by the Jaipuria Institute of Management, Ghaziabad, this conference arrives at a time when organizations worldwide are navigating unprecedented technological disruption. AI systems are reshaping decision-making, marketing, finance, supply chains, human resource management, governance, and entrepreneurship. Yet, alongside these opportunities emerge critical questions regarding transparency, trust, inclusivity, privacy, employment, and human agency. The future of management therefore depends not merely on technological advancement but on our collective ability to align innovation with human values.

The contributions featured in this Special Issue of JIM QUEST reflect this evolving landscape. The selected papers demonstrate the breadth and depth of contemporary research exploring the intersection of AI, management, sustainability, governance, and social transformation. Several studies examine AI's growing role in business performance and strategic decision-making. Research on AI-based automation and data analytics in logistics highlights how intelligent technologies are enhancing operational efficiency and supply chain resilience. Investigations into AI-driven advertising reveal the transformative impact of predictive analytics and personalization on consumer behaviour, while emerging conceptual work on consumer-AI collaboration illustrates how intelligent systems can encourage sustainable and indigenous consumption practices.

Equally significant are the contributions that place ethics, inclusion, and sustainability at the centre of technological innovation. The exploration of ESG disclosure quality and firm value underscores the increasing importance of responsible corporate behaviour in contemporary markets. Studies on AI-enabled ESG microfinance and gender-responsive digital financial inclusion demonstrate how technology can serve as a catalyst for economic empowerment, particularly for women and underserved communities. Such scholarship reminds us that the true

value of AI lies not merely in efficiency gains but in its capacity to foster equitable and inclusive development.

The social dimensions of AI are further illuminated through bibliometric and conceptual analyses of conversational AI in the social sciences and technology adoption among women-led self-help groups. These contributions reveal how AI and digital technologies are influencing human interaction, social inclusion, empowerment, and knowledge creation. They also highlight the importance of interdisciplinary inquiry in understanding the broader societal implications of intelligent systems.

Perhaps most compelling is the emerging discourse on human-centered AI reflected in studies of workplace spirituality and human-AI collaboration. As organizations transition toward Industry 5.0 paradigms, the focus is shifting from automation alone to the harmonious integration of human creativity, purpose, and technological capability. The future workplace must not only be productive and intelligent but also meaningful, empathetic, and psychologically sustainable.

Collectively, the articles in this Special Issue embody the essence of AIM-PEACE: a vision of AI that prioritizes people, embraces ethical responsibility, strengthens accountability, enables collaboration, and advances enterprise. They challenge the prevailing narrative that technological progress is solely a matter of innovation and efficiency. Instead, they advocate for a balanced approach in which AI serves as an instrument for human flourishing and societal advancement.

As an editor, I believe that management scholarship has a crucial role to play in shaping this future. Universities, research institutions, industry leaders, and governments must work collaboratively to develop frameworks that ensure AI remains transparent, fair, inclusive, and aligned with democratic and humanitarian values. The responsibility of management researchers extends beyond analysing technological change; it includes envisioning and influencing the kind of society that technological change will create.

I extend my sincere appreciation to the authors, reviewers, conference organizers, and academic contributors whose efforts have made this Special Issue possible. Their work exemplifies the intellectual rigor and social commitment necessary to address the opportunities and challenges of the AI era.

**Sincerely,**

Chief Editor

JIM QUEST

(Special Issue on AIM-PEACE 2026: AI in Management for People, Ethics, Accountability, Collaboration & Enterprise)

# JIM QUEST

Journal of Management and Technology

• Volume 22 • Issue No. 01 • January - June 2026

Special Issue on International Conference AIM-PEACE 2026

<b>Impact of ESG Disclosure Quality on Firm Value: Evidence from Indian Listed Companies</b> <i>Priyanka</i>	1
<b>Conversational AI in Social Sciences: A Bibliometric Study of Qualitative Research</b> <i>Seema Singh, Devika Dabas</i>	9
<b>AI-Based Automation, Data Analytics Capability and Supply Chain Performance: An Empirical Study of Logistics Companies in Uttarakhand</b> <i>Tushar Dhiman, Pankaj Madan</i>	30
<b>Mapping Technology Adoption and Digital Inclusion: A Bibliometric Analysis of Women-Led Self-Help Groups</b> <i>Kiran Shoshta, Devesh Kumar</i>	41
<b>Artificial Intelligence in ESG-Based Microfinance: Promoting Sustainability among Women Entrepreneurs</b> <i>Ramika Verma, Gargi Chaudhary</i>	52
<b>Gender Dimensions of Digital Financial Inclusion in India: Regulatory Frameworks and Global Perspectives</b> <i>Ravi Rose, Babita Jha</i>	66
<b>AI-Driven Advertising and the Transformation of Consumer Decision-Making: A Bibliometric and Empirical Investigation</b> <i>Saurabh Gupta, Vinitendra Pratap Singh</i>	75
<b>Humanizing Artificial Intelligence at Work: Integrating Workplace Spirituality and Human–AI Collaboration Research</b> <i>Yanshika Gulati, Devesh Kumar</i>	89



# Impact of ESG Disclosure Quality on Firm Value: Evidence from Indian Listed Companies

\*Priyanka

## Abstract

*This study examines the ways in which the Environmental, Social, and Governance (ESG) score affects the value of a company, as measured by market capitalization, using the legitimacy theory. The study examines the ESG disclosures of 100 Indian companies listed on the National Stock Exchange (NSE) over a five-year period from 2021 to 2025. It examines the three components of the ESG Score (environmental, social, and governance) that have the most significant influence on a company's value. The Thomson Reuters Eikon Refinitiv matrix is employed to calculate the ESG Score, which is then subjected to multiple regression analysis. The findings suggest that a company's value is enhanced by ESG disclosure. This implies that the market capitalization increases in tandem with the ESG score. Furthermore, the social score has the most significant impact on the value of the firm. By examining the three components of the ESG score in conjunction, this research adds to the extant ESG literature. The primary concentration of previous research was on the individual components of ESG. This study integrates all three elements of ESG to determine which one has the most significant influence on market capitalization.*

**Keywords:** : Environmental Social Governance score, ESG Disclosure Quality, Firm Value, Refinitiv matrix.

## 1. Introduction

Over the last forty years, environmental, social, and governance (ESG) responsibility has become more important to policymakers and stakeholders. For four decades, people have been asking: Can companies gain economic advantages by supporting social and environmental efforts? Because of risks related to social, environmental, and corporate governance, businesses participate in different ESG activities to encourage sustainable practices. These activities help define how a company contributes to solving environmental problems.

According to a survey by IQ Air in 2021, the five nations with the worst air pollution in 2021 were Bangladesh, Pakistan, Tajikistan and India. That means four of the world's most polluted countries are in India. Higher temperatures will mean more rain, so typhoons and flooding become more likely. This might drastically damage both the health of the people and the economics of the area, destroying houses and businesses. The adoption of CSR initiatives by corporations globally has grown

rapidly [3]. They are pressured to behave in a socially responsible way on a wide range of problems [4]. Academic research has begun to examine more thoroughly at how corporations are putting each aspect of the ESG framework into practice in the real world following these recent modifications.

ESG is composed of three primary components: (a) the environmental component; (b) the social component; and (c) the governance component. According to a study conducted in China, the value of a corporation is solely influenced by ESG disclosures in the environmental and social sectors [5]. ESG disclosures have been shown to increase the value of firms in developing countries, according to additional research [6]. Due to this, the researcher sought to investigate the impact of ESG reporting on the value of companies in Indian countries, with a particular emphasis on market capitalization.

This method of determining the market value of a company is derived from the objective of examining the impact of sustainability on market capitalization. Experts and students

\*Assistant Professor, Department of Management, KCC Institute of Legal and Higher Education, Greater Noida, UP, Email: priyankap000786@gmail.com

alike must comprehend the concept of corporate value. The income-based, asset-based, comparative, and stochastic methods are all alternatives for valuing a company, contingent upon the purpose of the valuation. In addition to determining the company's value, which is the final component, it is crucial to examine the factors that influence it, as this can contribute to the company's value increase [7].

Recently a new study field has emerged. It concerns the way investors act in terms of responsible investment. ESG indicators have been designed to assist investors in choosing firms that practice sustainability, are financially successful, and are ethically sound, thereby making them a viable tool for socially responsible investment [8]. ESG investment principles enable investors to stay clear of corporations that are detrimental to the environment and the health of people, and other immoral behaviors. By using these ideas, ESG may be a core factor in portfolio theory that affects the stock investments of a firm [9].

This study endeavors to address the disparity by investigating the relationship between ESG and firm value in India, utilizing legitimacy theory and considering the pandemic conditions of 2021-2025. By providing a comprehensive examination of the manner in which countries in India report on sustainability and the impact it has on their firm value, this study contributes to the existing literature.

It also enhances our understanding of ESG disclosure and practices in India, especially since previous studies had limitations when examining this region. Additionally, this study investigates which parts of the three ESG dimensions have the biggest impact on company value in India.

## 2. Literature Review

Reviewing the past literature in the area of research is a preliminary step before attempting to plan the study. An intensive review of literature gives the depth understanding regarding the present research work and it also enlightens the dimensions on which the previous researcher has done their work. It provided an overview of the finding of past researchers and also highlighted the methodologies used by them to achieve these findings. A brief summary of available literature on the subject is presented in this section.

**Eriksson J. et al. (2026)**<sup>1</sup> explored the relationship between ESG and firm value, along with investigated the time impact of ESG. Moreover, the study delved into the analysis of both traditional and controversial stocks. Employing a deductive approach with multiple hypotheses, a fixed effects model was utilized, and the OLS regression approach was implemented for the analysis. Stakeholder and shareholder theory were implemented to identify the benefits and drawbacks of corporate social

responsibility, while legitimacy theory was implemented to clarify the rationale behind the implementation of ESG standards. A sample was employed to conduct the investigation from the S&P 500 spanning a 15-year timeframe. An insignificant correlation was observed between ESG and firm performance. The research was unable to demonstrate the impact of ESG on firm value, suggesting that there is a degree of variability in the relationship between ESG and company value.

**Atan R. et al. (2025)**<sup>2</sup> investigated the influence of ESG factors on the financial performance of Malaysian public limited companies. Profitability, cost of capital, and firm value were the criteria used to evaluate the financial performance. The cohort consisted of 54 corporations, and data was collected from Bloomberg's database for the years 2010 to 2013. Panel data regression analysis was implemented in the investigation. The results suggested that there was no significant correlation between ESG and ROE, regardless of whether Tobin's Q was viewed as an individual or combined factor. Nevertheless, the cost of capital (WACC) was significantly influenced by ESG factors when examined individually. The results were intriguing in that they demonstrated a substantial and positive influence of the combined ESG factors on the WACC (cost of capital).

**Brogi M. et. al. (2024)**<sup>3</sup> investigated the relationship between company profitability and ESG disclosure in relation to ROA (Return on Assets). Their research employed a comprehensive dataset of US-listed companies from 2000 to 2016, which was sourced from ESG KLD MSCI Statistics data. The study investigated the relationship between ESG scores and a variety of ROA related factors by conducting a statistical analysis of 17,358 data points. The results demonstrated a significant positive correlation between ESG score and firm value, with a particular emphasis on the robust relationship between environmental consciousness and the financial performance of companies.

**Li Y. et. al. (2023)**<sup>4</sup> conducted a research study that examined the impact of ESG (environmental, social, and governance) disclosure on the economic performance of firms by utilizing an extensive cross-sectional database of FTSE. The research examined 350 publicly listed companies and identified a positive correlation between financial performance and ESG disclosure. Additionally, their research revealed that greater CEO authority led to increased efforts in ESG disclosure, ultimately enhancing firm value. This suggests that stakeholders associate ESG disclosure with firms that have powerful CEOs who are actively engaged in ESG initiatives. The study presented compelling evidence of ESG disclosure impacts through the utilization of Heckman's two-stage estimation techniques and an instrumental variable approach.

**Kartikasary, M., et. Al. (2023)<sup>5</sup>** examined the legitimacy theory-based relationship between the Environmental, Social, and Governance (ESG) score and firm value, as measured by market capitalization. The study examines the environmental, social, and governance (ESG) disclosures of 608 companies in Southeast Asia over a five-year period. The most significant impact on company value is the evaluation of the three dimensions of the ESG Score (environmental, social, and governance pillar scores). The Thomson Reuters Eikon Refinitiv matrix is used to derive the ESG Score, which is then analyzed using multiple regression. The results suggest that ESG disclosure has a beneficial impact on firm value, suggesting that a rise in market capitalization is correlated with an increase in the ESG score. Furthermore, the social score is identified as the factor that has the most significant influence on the value of the firm. This study enhances the current ESG literature by investigating the three components of the ESG score. This research evaluates the interplay of all three components and their relationship to firm value to ascertain which has the most substantive impact on market capitalization, rather than focusing on individual ESG components, as did previous studies.

**Thesing and Velte (2021)<sup>6</sup>** conducted a study that examined the influence of firm value assessments on earnings quality and emphasized the moderating effect of corporate governance. Their study was review based and began the data collection in August 2018 and last updated it in July 2019. The final sample comprises the 162 relevant articles. The reviewed articles were structured into five categories: (1) earnings persistence and predictive ability, (2) discretionary accruals, (3) target beating and properties of analysts' forecasts, (4) earnings variability, and (5) other earnings quality measures. They concentrated on accounting-based earnings quality indicators, which have a number of advantages for investigating agency-related earnings. They found three major findings first, firm value measurements show mixed earnings quality; second, lower-level firm value measurements decrease earnings quality; Third, corporate governance initiatives enhance the quality of earnings.

**Altawalbeh (2020)<sup>8</sup>** the author investigated the influence of firm value accounting as determined by other comprehensive income on information asymmetry as measured by the bid-ask spread in Jordanian banking sector. For the research he took as a sample 13 commercial banks listed on Amman Stock Exchange from 2010 to 2017. He used the test statistics i.e. Descriptive statistics, Pearson correlation, Regression analysis & F-statistics. The findings revealed that firm value accounting has a negative and significant impact on information asymmetry in Jordanian commercial banks, and FVA provides stakeholders

with accurate and appropriate data and represents the informational value of firm value numbers to investors. Although the findings imply that enforcing the use of firm value values is favorable. The author points out many drawbacks. To begin with, the sample is restricted to the banking industry, which is defined by tough governance requirements supervised by the Jordanian Central Bank. As a result, they are unable to extrapolate the findings to other industries. Second, he used the bid-ask spread as a single variable as a proxy for information asymmetry, which may or may not provide the same results, for which he suggests two more studies. The first is to undertake a comparison study across sectors in order to capture cross-sector variances, and the second is to independently examine the impact of the three firm value levels.

**Dang, Nguyen, and Tran (2020)<sup>9</sup>** examined the extent to which earnings quality impact firm value. They employed GLS regression analysis in their research, which involved 3,910 observations of listed firms on the Vietnam Stock Exchange from 2010 to 2018. The study examined the extent to which earnings quality influences the value of a firm. The outcome indicates that earnings management, the persistence of earnings, and the timeliness of earnings information are the metrics by which earnings equities are evaluated, all of which have a positive impact on the value of the firm. The firm value is positively influenced by the control variables of firm size, the rate of investment in fixed assets, and the rate of dividend payment. Conversely, the determinants of financial leverage, revenue growth rate, and market value to book value ratio are inversely correlated with firm value in accordance with economic value (EV), Tobin's Q, or Price.

## 2.1 Identification of the Research Gap

This investigation examines the relationship between potential investors and their investment activities in relation to ESG indicators. The objective is to determine whether ESG is a factor that influences the value of firms in India. ESG disclosure is one important factor that can influence firm value, especially since countries in India are known for pollution, which makes this topic interesting. Therefore, the research will explore two main questions: "How does the quality of ESG reports impact firm value in India?" and "Which components—environment, social, or governance—are the most important in influencing firm value?"

## 2.2 Objectives of The Study

1. To examine the impact of Environmental, Social, and Corporate Governance (ESG) scores on the firm value of selected Indian companies.
2. To examine the impact of Environmental scores on the firm

- value of selected Indian companies.
3. To examine the impact of Social scores on the firm value of selected Indian companies.
  4. To examine the impact of Corporate Governance scores on the firm value of selected Indian companies.

### 2.3 Hypotheses of The Study

This study aims to explore the findings of research through the lens of legitimacy theory. According to legitimacy theory, a company's operations need a social license that it gets from the community where it works [27,33]. The more the local community accepts the company, the more valuable the company appears to stakeholders. Therefore, actions related to ESG for the environment are anticipated to boost stakeholder acceptance of the company's activities, which aligns with legitimacy theory. The hypotheses proposed for this study are as follows:

**H01:** There is no significant difference Environmental, Social, Governance scores effect on the firm value in selected Indian companies.

**H02:** Environmental scores have no significant impact on the expected firm value in selected Indian companies.

**H03:** Social scores have no significant impact on the expected firm value in selected Indian companies.

**H04:** Governance scores have no significant impact on the expected firm value in selected Indian companies.

## 3. Research Methodology

This study looks at ESG data from Thomson Reuters Eikon Refinitiv. It examined 100 companies in India over a period of 5 years, from 2021 to 2025.

### 3.1 Data

The information was gathered from Thomson Reuters Eikon Refinitiv and examined using a multiple regression method. The main focus of this study is market capitalization, which represents the value of a firm. The independent variable in this research is the ESG Scores (Environmental, Social, and Governance Score) sourced from the Thomson Reuters Eikon Refinitiv database. The ESG score that was analyzed was calculated and

provided by Thomson Reuters Eikon Refinitiv; this score ranges from 0 (the weakest) to 100 (the best). The ESG data available on Refinitiv's Eikon includes 90% of all companies globally, utilizing over 100 ESG metrics since 2002, as shown in figure 1. Refinitiv's ESG score is created to clearly and fairly assess a company's ESG performance, commitment, and effectiveness, based on data reported by the company [34]. Refinitiv gathers ESG data by

looking at company annual reports, NGO websites, CSR reports, company websites, stock market documents, and news articles. Once the data is collected, Eikon employs 800 researchers to examine the ESG data from all over the world. They put it together to create an ESG database, which goes through a thorough audit and management review process before it is finalized. The main focus of this research is on several factors like the size of the company, ROA, ROE, stock price ratio, how much the company is leveraged, profit growth, the country, and the industry sector, which are categorized by GICS (Global Industry Classification Standard), and the impact of the Covid-19 pandemic. The next section will explain how each of these factors is measured.

### 3..2 Independent Variables ESG Score

The ESG (Environment, Social, and Governance) Score from Thomson Reuter Eikon Refinitiv is the primary focus of this study. The ESG Score is a metric that assesses the performance, funding, and specific securities of a company in relation to environmental, social, and corporate governance issues. Thomson Reuters Eikon Refinitiv calculated and provided the ESG scores that were analyzed. The scores in this methodology range from 0 (the weakest) to 100 (the finest).

1. The First Quartile, which has a score ranging from 0 to 25, indicates that the company shares ESG data with the public in a manner that is not transparent and has subpar ESG performance.
2. The company's ESG performance is satisfactory, and it shares ESG data with the public in a moderately transparent manner, as indicated by a score of 25 or higher but less than 50 in the Second Quartile.
3. The Third Quartile, which has a score of 50 or higher and a maximum of 75, suggests that the company is above average in terms of transparency and its performance in ESG.
4. Lastly, the Fourth Quartile, which scores from 75 to 100, demonstrates that the company is highly transparent in its ESG data reporting to the public and has outstanding ESG performance.

The Environment score comes from looking at how a company uses its resources, the emissions it creates, and the new ideas it has to lessen the effect of those emissions on the environment.

Social scores are based on examining workers, human rights, community involvement, and how responsible the products are. The governance score is determined by analyzing the management, shareholders, and the CSR strategies that the company implements. The way the ESG Score is calculated using

Thomson Reuters Eikon Refinitiv is shown in Figure 1 below:

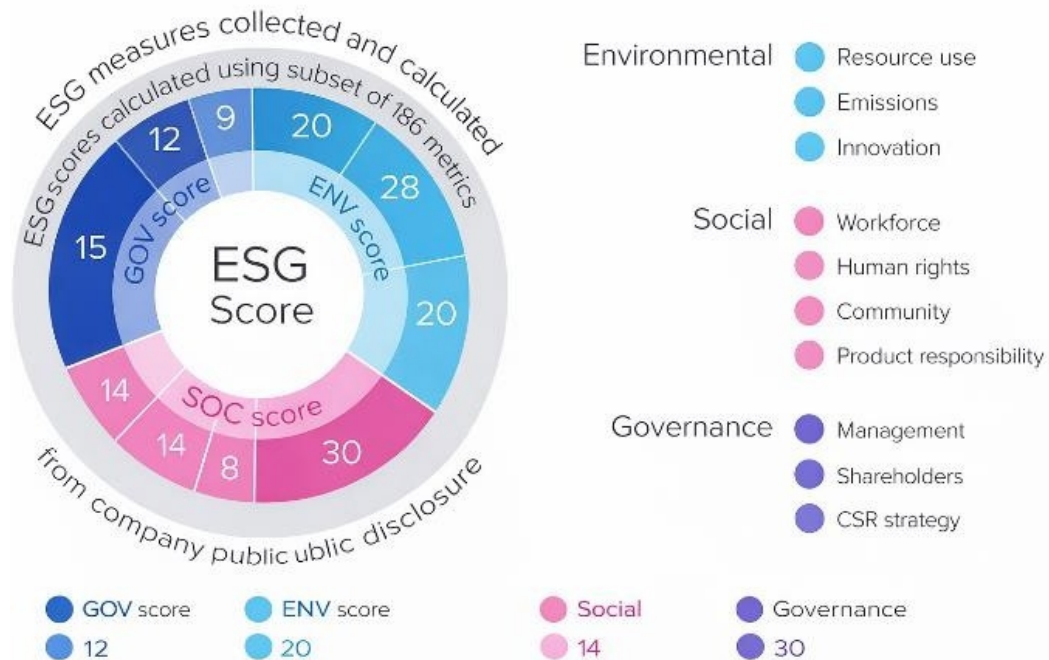


Figure 1: ESG Framework

### 3.3 Dependent Variable

#### Value of the Firm (Market Capitalization)

The market capitalization (MC) is the dependent variable in this investigation. Market capitalization is the stock market's assessment of a company's value. The total market value of all presently available shares is the one that is used to calculate it. Companies with larger market capitalizations are generally regarded as secure investments due to their lengthier business histories and greater levels of stability.

Thomson Reuters Refinitiv Eikon determines market capitalization (MC) by aggregating the total number of shares issued and held by both internal and external shareholders. Free float shares, which are shares that are available for trading in the secondary capital market, are also included. After this, the last closing price is multiplied by the sum, as illustrated in the equation below:

$$MC = \text{"Closing Price"} \times (\text{Total Number of Outstanding Shares} + \text{Free Float Shares})$$

#### 3.4 Control Variables

This research uses a few control variables. You can see how these control variables are measured in Table 1 below.

Variables	Measurement
FIRM SIZE	The logarithm of Total asset= Ln (Total Asset)
ROE	$\frac{\text{Net Income}}{\text{Total Equity}}$
ROA	$\frac{\text{Net Income}}{\text{Total Asset}}$
P/E Ratio	$\frac{\text{Stock Price}}{\text{Total Equity}}$
PROFIT GROWTH	$\frac{\text{Net Income } t - \text{Net Income } -1}{\text{Net Income } -1}$
LEVERAGE	$\frac{\text{Total Debt}}{\text{Total Asset}}$
PANDEMIC	Dummy Variable

#### 3.5 Research Models

The control variables for this study include company size, Return on Equity (ROE), Return on Asset (ROA), stock price ratio (P/E), profit growth, leverage, country, and GICS (Global Industry Classification Standard) industrial sector classification, all of

which are examined using Multiple Regression Analysis. Two regression experiments were conducted to determine the extent to which the ESG Score influences firm value and to determine

$$MC = a + \beta_1 \text{ESG}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{ROE}_{it} + \beta_4 \text{ROA}_{it} + \beta_5 \text{PE}_{it} + \beta_6 \text{GROWTH}_{it} + \beta_7 \text{LEV}_{it} + \beta_8 \text{COUNTRY}_i + \beta_9 \text{SECI} + \beta_{10} \text{COVID}_t + \beta_{11} \text{YEAR}_t + \epsilon \text{ (Model 1)}$$

$$MC = a + \beta_1 \text{E}_{it} + \beta_2 \text{S}_{it} + \beta_3 \text{G}_{it} + \beta_4 \text{SIZE}_{it} + \beta_5 \text{ROE}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{PE}_{it} + \beta_8 \text{GROWTH}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{COUNTRY}_{it} + \beta_{11} \text{SECI} + \beta_{12} \text{COVID}_t + \beta_{13} \text{YEAR}_{it} + \epsilon \text{ (Model 2)}$$

- MC = Market Capitalization
- ESG = ESG Score Thomson Reuters Eikon Revinitif
- E = Environment Score Thomson Reuters
- Eikon Revinitif S = Social Score Thomson Reuters Eikon Revinitif
- G = Governance Score Thomson Reuters Eikon Revinitif
- a = Constanta
- β1-13 = Coefficient
- Regression e = Error

## 4. Analysis & Result

### 4.1 ESG and Firm Value

This study uses multiple regression analysis to examine the data.

Variables	Coefficient	P-Value
ESG	1.70E+07	0.034
ROE	-1.95E+08	0.673
ROA	6.27E+09	0.000
SIZE	1.76E+09	0.000
LEV	-1.57E+08	0.007
P/E	2.48E+16	0.027
GROWTH		
7.90E+07		
0.005		
PANDEMIC	-1.38E+09	0.000

**Table 2.** Regression Result of ESG's Score on Market Capitalization

(Note: Adjusted R<sup>2</sup> 0.3857, Significance 5%)

The first regression results are presented in Table 2, which demonstrate a positive and significant correlation between ESG and market capitalization, with a p-value of less than 0.05. This implies that H01 is acknowledged, suggesting that the ESG score has a positive effect on the value of a firm in India. Here, the constant value is 1.70E+07, which indicates that the company's value increases by 1.70E+07 for every 1-point increase in the

which component of ESG—environmental, social, or governance—has a greater impact on firm value. The investigation methodology is as follows:

ESG score. The adjusted R square value for this equation is 0.3857, which is equivalent to 38.57%. The coefficient of determination, which is represented by the adjusted R square value, elucidates the extent to which the independent variable influences the dependent variable.

This value indicates that the dependent variable is reasonably correlated with all of the independent variables. The independent variable influences market capitalization by 38.57%, as indicated by the adjusted R square value. The remaining 61.43% is attributable to other variables. This result is a result of previous research that demonstrated the impact of ESG on market capitalization [5,6,16]. Firm value is positively influenced by ESG reporting. The firm's ESG initiatives are detailed in these ESG disclosures, which are available to stakeholders. They are essential for the advancement of the firm's value and the attraction of investors to socially responsible investments by enhancing reputation, mitigating risks, increasing transparency, and steering management. The results of this research are consistent with previous research that suggests that companies can increase their firm value by disclosing ESG information as a result of a positive relationship. ESG disclosure assists investors in their investment decisions and assists regulators in supervising ESG activities [25]. The ESG score, which is positively correlated with firm value, implies that an increase in firm value will result from enhanced ESG quality, as evidenced by a higher ESG score. A subsequent regression test was conducted to determine the impact of each of the three ESG (Environment, Social, and Governance) pillars on the firm's value. Table 3 illustrates the results of this second regression.

The second regression results in Table 3 suggest that the Social score was the sole factor that affected firm value, with a p-value of less than 0.05. There was no significant correlation between the environmental and governance scores, as indicated by a p-value of greater than 0.05. This implies that H03 is approved, whereas H02 and H04 are rejected. Firm value in India is positively influenced by social scores, while environmental and corporate governance scores do not have an impact on firm value in the same region.

Variables	Coefficient	P-Value
SOCIAL	1.68E+07	0.033
ENVIRONMENT	1426416	0.837
GOVERNANCE	-3041069	0.586
ROE	-1.94E+08	0.674
ROA	6.27E+09	0.000
SIZE	1.74E+09	0.000
LEV	-1.58E+08	0.007
P/E	2.51E+16	0.026
GROWTH	7.90E+07	0.005
PANDEMIC	-3041069	0.000

**Table 3.** Regression Result of Each Component ESG on Market Capitalization

The regression results indicate a steady value of 1.68E+07, which means that for every 1-point increase in the social pillar score, the company's value will rise by 1.68E+07. The adjusted R square value for this equation is 0.3837, or 38.37%. This suggests that there is a moderate connection between all the independent variables and the dependent variable. The adjusted R square value shows that the independent variables together account for 38.37% of the market capitalization, while the other 61.63% is influenced by different factors.

## 5. Conclusion

This study aims to look into how the quality of ESG reporting affects the worth of companies in India. The findings show that high-quality ESG reporting has a positive and important impact on a company's value. This means that better ESG reporting can lead to higher company values in India. This research supports earlier studies.

These findings can be understood using stakeholder theory. The environmental (E), social (S), and corporate governance (G) pillars, known as ESG, are factors that don't involve money but are becoming more important and popular with investors. ESG is included in analyzing investment portfolios to help spot chances and possible dangers. Also, this indicator assists investors who want to make sustainable investments by steering clear of companies that might have financial problems because of their questionable environmental and business practices.

This research looks deeper into the three main parts of ESG and discovers that only the social part has a positive and important effect. This might be because many companies share more information and do more activities related to social issues

through their CSR efforts compared to the environment and governance. Another reason could be that investors in India focus on the social activities of companies, hoping these will help increase the company's value. However, future studies should be done to explore each part of ESG and how they affect a company's value for a more detailed analysis of each part.

This study's findings add to the ESG literature about companies in India. It shows that these companies need to do good ESG activities to be seen as legitimate in their communities. This acceptance helps them get the resources they need to function, according to legitimacy theory. In the end, this can boost the company's value since they will have what they need to increase shareholder value. Companies in India should focus on social activities more than environmental and governance ones because, out of these three areas, only social activities really impact the company's value. This might be because investors looking to invest in Indian companies care a lot about the social activities those companies are involved in.

The study still has room for improvement. Further research is anticipated to explore the connections between each country or sector as additional testing. Based on the findings of this study, which show that the social pillar is positively linked to firm value, future studies should examine the three components in more detail to provide a broader understanding of this research.

## References

- Eriksson, J., & Asgodom, D. (2026). *Perspectives of ESG performance—A study of ESG Performance Effect on Firm Value in the US*. Department of Business Administration, <https://lup.lub.lu.se/student-papers/search/publication/8980568>.
- Atan, R., Alam, M. M., Said, J., & Zamri, M. (2025). *The Impacts of Environmental, Social, and Governance Factors on Firm Performance: Panel Study on Malaysian Companies*. *Management of Environmental Quality: An International Journal*, 29(2):182-194, DOI:10.1108/MEQ-03-2017-0033.
- Brogi, M., & Lagasio, V. (2024). *Environmental, Social, and Governance and Company Profitability: Are Financial Intermediaries Different? Corporate Social Responsibility and Environmental Management*, 26(3), 576-587. DOI: 10.1002/csr.1704.
- Li Y., Gong M., Zhang X. & Koh Lenny (2023). *The Impact of Environmental, Social and Governance Disclosure on Firm Value: The Role of CEO Power*. *The British Accounting Review*, 50(1) DOI: 10.1016/j.bar.2017.09.007.
- Kartikasary, M., Adi, M. P. H., Sitinjak, M. M., Hardiyansyah, & Sari, D. Y. (2023). *Environmental, social and governance*

- (ESG) report quality and firm value in Southeast Asia. *E3S Web of Conferences*, 426, 02087.
- Wasiuzzaman, S., Ibrahim, S. A., & Kawi, F. (2022). ESG disclosure and the cost of equity capital: The moderating role of analyst coverage. *Meditari Accountancy Research*.
- Tan, D., Komal, B., Ezeani, E., Usman, M., & Salem, R. (2022). Carbon emissions and the cost of debt: Evidence from the UK. *Environmental Science & Policy*, 137, 109-117.
- Şerban, R. A., Mihaiu, D. M., & Țichindelean, M. (2022). Exploring the Determinants of ESG Disclosure. *Sustainability*, 14(13), 8031.
- Boshnak, H. A. (2022). Determinants of corporate social responsibility (CSR) disclosure: evidence from Saudi Arabia. *Journal of Financial Reporting and Accounting*, 20(3/4), 667-692.
- Siddique, M. A., Akhtaruzzaman, M., Rashid, A., & Hammami, H. (2021). Carbon disclosure, carbon performance and cost of equity capital: A global evidence. *International Review of Financial Analysis*, 75, 101734.
- Zumente, I., & Bistrova, J. (2021). ESG Importance for Capital Markets: Institutional Investors' Expectations and Responses. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(4), 221.
- Wong, W. C., Batten, J. A., Ahmad, A. H., Mohamed-Arshad, S. B., Nordin, S., & Adzis, A. A. (2021). Does ESG certification add value? *Journal of Banking & Finance*, 124, 106000.
- Zhang, F., Qin, X., & Liu, L. (2020). The Interaction Effect of ESG Performance and Institutional Investors' Distraction on Corporate Fraud. *Sustainability*, 12(5), 1866.
- Hill, J. (2020). *Environmental, Social, and Governance (ESG) Investing: A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio*. Academic Press.
- Wibbens, P. D., & Siggelkow, N. (2020). Introducing LVA: The sustainable alternative to total shareholder return. *Strategic Management Journal*, 41(2), 175-203.
- Taliento, M., Favino, C., & Netti, A. (2019). Impact of Environmental, Social, and Governance Information on Economic Performance: Evidence of a Corporate 'Sustainability Island' from EU Companies. *Sustainability*, 11(23), 6681.
- Fatemi, A., Glaum, M., & Kaiser, S. (2018). ESG performance and firm value: The moderating role of disclosure. *Global Finance Journal*, 38, 45-64.
- Brooks, C., & Oikonomou, I. (2018). The effects of environmental, social and governance disclosures and performance on firm value: A review of the literature. *The British Accounting Review*, 50(1), 1-15.

# Conversational AI in Social Sciences: A Bibliometric Study of Qualitative Research

\*Seema Singh  
\*\*Devika Dabas

## Abstract

*Artificial Intelligence (AI) powered chatbots have been rapidly integrated into various sectors such as social, educational, healthcare and communication, which has led to extensive research in the field of understanding the implications of the use of AI in society. The present research is a structured bibliometric and content analysis of qualitative research on the use of chatbot in the social sciences field from 2019 to 2026. The sources drawn from reputable Scopus journals were used to analyze 228 articles through the interface of the Biblioshiny and the VOSviewer. Conceptual, intellectual and social structure analysis was used for the analysis of the prominent authors, journals, documents, thematic evolution, collaboration patterns and emerging trends in this rapidly growing field. The study shows that there is a growing, noticeable inclination towards more academic work on qualitative research of chatbots. Emerging themes are identified in major thematic clusters like ethical perception, trust, user adoption, generative AI, sensory AI, human-chatbot interaction, emotional intelligence, and mental health. The research results present the dynamic development of the qualitative research on the chatbots in social sciences. The results of the research is addressed to the dynamic development of the qualitative research on chatbots in the social sciences. The study pinpoints gaps in the thematic areas and outlines potential future research avenues, including theoretical development, ethical governance, methodological advances, cultural considerations, sector-specific applications and emerging AI ecosystems. It helps to create a knowledge framework and research agenda for qualitative chatbots studies in social sciences.*

**Keywords:** Conversational Agents, Qualitative Research, Thematic Mapping, Bibliometric Analysis.

## Introduction

Artificial Intelligence (AI) has become a revolutionary technology in the 21st century, significantly reshaping how people, organizations, and societies interact, communicate and interact with information. The epistemological frameworks that guide social science research on social behaviour, social cognition and social processes are also being transformed by the advent of AI-powered digital transformation, which has refashioned industry and public service operational architectures (Haenlein & Kaplan, 2019; Wirtz et al., 2019). In this general paradigm shift, conversational agents (CA), including chatbots, virtual assistants and agents powered by conversation, has become one of the most socially impactful technology developments that has ever occurred, providing an

unparalleled way for people to engage in interaction with machines in natural language, and to communicate and interact with one another in a memorable, increasingly synthetic fashion.

Chatbots are a broad term referring to applications of software that mimic human conversation, broadly defined as software that has capabilities to interact humanly, through either text or voice. Early CA models such as ALICE and ELIZA used pattern matching algorithms and finite decision trees to only respond in pre-programmed ways (Weizenbaum, 1966). A new generation of data-driven chatbots, capable of understanding context, sentiment, and generating dynamic responses were introduced

\*Associate Professor, Institute of Management Studies and Research (IMSAR), Maharshi Dayanand University, Rohtak, Haryana, India Email: dahiyaseema@hotmail.com  
ORCID ID: 0000-0003-2434-4708

\*\*Research Scholar, Institute of Management Studies and Research (IMSAR), Maharshi Dayanand University, Rohtak, Haryana, India, Email: devikadabas33@gmail.com  
ORCID ID: 0000-0003-1894-6673

with the introduction of machine learning, deep neural networks and natural language processing (NLP) (Kusal et al., 2022; Adamopoulou & Moussiades, 2020). This trend resulted in the introduction of large language model (LLM) systems, including OpenAI's ChatGPT, which brought a new level of sophistication to natural language dialog, reasoning and contextual adaptability, thus making high-level AI communication tools more broadly available around the world. The surge of chatbots and conversational AI into areas of social science relevance has been breathtaking (Androutsopoulou et al., 2019). AI chatbots are part of the educational environment as pedagogical assistants, adaptive tutors, and academic support tools, transforming the relationship between teacher and student, raising issues around academic honesty, access to education, and co-production of knowledge (Khosravi et al., 2023; Dwivedi et al., 2023). From patient triage to mental health counselling from the management of chronic diseases to pharmaceutical support, conversational agents act as a facilitator between digital health and the patient journey, finding their place in diverse healthcare applications Abd-Alrazaq et al. (2019). In the e-commerce and retail sector, customer service is a key interaction channel with customers, playing a crucial role in shaping consumer engagement, satisfaction, and loyalty (Abd-Alrazaq et al., 2019; Han & Zhao, 2025). Likewise, the banking sector has also embraced AI-powered virtual assistants in financial services, fraud detection and prevention, and customer interaction, while public sector AI bots are becoming more prevalent, with an increasing number of "mediating citizen-government relations, service provisioning, and civic communications". The mental health landscape has been a hotspot for the potential of conversational AI to deliver convenient mental health care, and researchers have reported benefits and drawbacks of emotional dependence resulting from conversations with them.

In this vast and rapidly growing spread of chatbot technology into social contexts, it is becoming clear that quantitative performance metrics are not enough to describe interactions between humans and chatbots. Moreover, qualitative inquiry has an irreplaceable role in the scholarship of chatbots because it can uncover lived experiences, how people interpret their experience, and the socially constructed meanings that they bring to their conversations with conversational AI. They are perceptual-experiential phenomena which cannot be scaled into operationalization; it is not possible to reduce a chatbot interlocutor to a scale (Araujo, 2018; Nass & Moon, 2000). Likewise, the methods must be context sensitive, narratively and meaningfully oriented, in relation to trust formation, ethical considerations, perception of privacy, emotional labor, and negotiating identity within human-AI relationships (Følstad et

al., 2024; Al-Shafei, 2025). Qualitative research designs, which offer epistemological depth, can be used to explore these aspects of chatbot interaction that are often overlooked in quantitative models, such as in-depth interviews, focus groups, ethnographic observation, phenomenological inquiry, and discourse analysis.

This has increasingly been recognised by the academic world. However, qualitative methods have been used in several studies to explore how users experience the chatbots, for example in communication studies, information systems, consumer behaviour and psychology (Al-Shafei, 2025; Skjuve et al., 2022; Laestadius et al., 2024), in the context of different constructs, including emotional connection, perceived empathy, narrative trust, ethical discomfort and social construction of chatbot personhood (Kasneji et al., 2023; Tlili et al., 2023). The post-ChatGPT research scene has further complicated this scholarly shift with the unprecedented naturalism and contextual fluency of LLM-powered chatbots, raising the profile of issues related to authenticity, deception, relational ethics, and human vulnerability in AI interaction that require qualitative research methods (Xu et al., 2023; Al-Shafei, 2025). Consequently, there has been a notable increase in the qualitative research surrounding chatbots, which has become a significant and multidisciplinary field of scholarship, but one that has not been fully mapped in terms of how it is organised, how it has developed as a field of study and where new knowledge is emerging (Laestadius et al., 2024; Han & Zhao, 2025).

Although this is an active and promising research area, there is a clear need for systematic and comprehensive mapping of qualitative research on chatbots in the social sciences, given the existing literature. Although there have been several bibliometric and systematic reviews of the field of chatbot scholarship more broadly (which tend to focus on technical and human-computer interaction and quantitative traditions), there has yet been a dedicated bibliometric investigation that has paid specific attention to the qualitative research strand in the context of social sciences (Khosravi et al., 2023; Tanwar & Verma, 2024). The current reviews have therefore only offered partial insights into the intellectual development, thematic focus, productive authors and temporal evolutions of the scholarship of qualitative chatbots, resulting in a consequential lack of understanding and strategic orientation of the field.

The analysis of bibliometric properties of a scientific field, discussed in this paper, is well established and rigorous method in the field of research information science, and these methods are called bibliometric analysis and science mapping (Donthu et al., 2021; Zupic & Čater, 2015). Descriptive bibliometric indicators (such as publication trends, citation patterns,

productivity of sources and authors and geographical distribution of publications) can then be combined with visual science mapping methods (such as keyword co-occurrence analysis, co-citation analysis, and bibliographic coupling) to create a multi-dimensional picture of a field's evolution, intellectual communities, and emerging research frontiers (Aria & Cuccurullo, 2017). This type of analysis is particularly relevant in rapidly changing disciplines where scholarship is extensive and fast moving, making it difficult to keep up with the narrative literature review.

This research gap is filled by carrying out a thorough bibliometric and science mapping analysis of 228 articles from the qualitative research field included in Scopus, from the social sciences field focused on chatbots, conversational AI, conversational agents, and AI chatbots. The study is based on the descriptive bibliometric analysis and the science mapping methodology developed by VOSviewer and Bibliometrix to systematically map this field, highlight the top authors, institutions, journals, and countries, delineate the major thematic clusters, and reveal the field's intellectual evolution, particularly the paradigm-shifting developments since the beginning of 2022 and the rise of ChatGPT. This study contributes to the literature in several ways, including the first bibliometric portrait of qualitative chatbot research in social sciences, identification of underexplored thematic frontiers and methodological gaps, and a theoretical framework for the roadmap on the future of qualitative research in the field of human-AI interactions. This paper is organized as follows: Section 1 describe introduction; Section 2 outlines the focused review of previous bibliometric and science mapping research on chatbots and other AI phenomena; Section 3 describes the methodological framework; Section 4 presents the results and Section 5 discusses the results; section 6 provide future research directions; section 7 discusses the implications and section 8 conclude the study with limitations.

## 2. Literature Review

The bibliometric and science mapping of the research about chatbots and conversational AI has in turn turned into an active – and growing – scholarly enterprise, and the academic community has been eager to make sense of the constantly increasing knowledge base. A literature review on this secondary literature shows that there is a clear development from early mappings of general AI-chatbot research, to systematic reviews of specific domains, to specific more recent analyses triggered by the transformative potential of the appearance of large language models and ChatGPT. It is important to grasp this trajectory to contextualize the current study and to outline the unique contribution of this study.

In 2020, Adamopoulou and Moussiades gave a systematic review of the chatbot architectures and developed a taxonomy for conversational agent systems. Their technical paper emphasized the growing importance of chatbots in the fields of education, healthcare, and customer service. Additionally, Rapp et al. (2021) studied the acceptance and experience related to chatbots in 73 studies, in which they examined anthropomorphism and perceived social presence, and highlighted the absence of qualitative studies in the literature.

Since 2022, the emergence of ChatGPT has greatly shaped the post-2022 bibliometric landscape, resulting in a significant increase in publications and systematic mapping studies related to ChatGPT. Khosravi et al (2023) carried out a literature review of 8370 publications on chatbot and ChatGPT from Scopus and Web of Science and identified three major thematic clusters (AI technologies, design and evaluation of conversational agents, and digital technologies in mental health) using VOSviewer. In their study, they pointed out ChatGPT as a novel research frontier but ignored methodological differences in the qualitative approach. Tanwar and Verma (2024) analysed 798 papers published between 2001 and 2022 that have been indexed in Scopus, but they failed to consider the developments that occurred after 2022 and the social science perspective, which were changed by the methodological shift of generative AI.

Han and Zhao (2025) conducted a bibliometric analysis of 261 articles published in the Web of Science from the year 2015 to 2024. They found that the number of articles published in this period grew at a rate of 46.19% per year, and the focus of these articles shifted towards "ChatGPT", "large language models", and "machine learning" by 2023. The U.S. became the top contributor. The study was not in focus of qualitative methodology; thus, it is less relevant to qualitative researchers. Furthermore, the bibliometric analysis of trust in conversational agents examined 955 studies on Scopus from 2009 to 2024, revealing increased trends in research on trust since the introduction of ChatGPT, with the U.S., Germany, China, and the U.K. as the primary research areas. The qualitative-quantitative distinction was also ignored in this study. Finally, Ramya and Alur (2023) conducted a study on chatbot research in the field of business and management, and they observed that there has been a significant growth in this field from the consumer behavior perspective; and again, they ignored qualitative methodological approaches.

Although the growth of education chatbots is documented, the themes of human-computer interaction and pedagogical efficacy seem to prevail, with no distinction made between qualitative and quantitative methods (Lin & Yu, 2024). A clear

pattern can be seen in the lack of development in chatbot studies, as the ethnographic and qualitative methods of research are underrepresented, and a call for methodological pluralism to explore the experiential and ethical aspects is made (Ayanwale et al.,2026). But, there is a lack of specific study on qualitative chatbot research, which is a big gap in understanding how the themes and collaborative evolution in these areas.

The current study directly tackles this gap. This bibliometric and science mapping analysis, which only covers the qualitative research articles published between 2022 and 2026 and indexed in the Scopus database, gives the first specific intellectual picture of the unique and important scholarly tradition that has been built around the themes of chatbots, conversational AI, conversational agents, and AI chatbots in social science contexts. Along the way, it captures and records the state of qualitative research on chatbots in the social sciences and creates actionable insights into the thematic frontiers of this scholarship, productive knowledge clusters, and the reconfiguration of its conceptual landscape by generative AI. The novelty of this study is not just the bibliometric approach itself but also its principled attempt to make visible a qualitative approach that had been marginalized under and made invisible by the broader quantitative and technical approaches to the study of chatbots.

### **3. Research Methodology**

The literature screening process was carried out in a systematic way, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological rigor and the reproducibility of the literature screening process (Page et al. 2021). The PRISMA flowchart (Figure 1) outlines the four consecutive steps (Identification, Screening, Eligibility and Inclusion) by which the final corpus of 228 documents was obtained.

During Identification, a structured Boolean search string was developed that included these elements: qualitative research, chatbot, AI chatbot, conversational AI, virtual assistant, conversational agent, ChatGPT, and generative AI. The first search found 756 records. During the screening phase, the inclusion criteria were applied to include english peer-reviewed journal articles from all areas of Social Sciences, Business Management and Accounting and Decision Sciences published between 2019 and 2026. Of those, 520 were excluded because they were non-English, in press, in books, review papers, conference papers or conference proceedings, leaving 236 to be assessed further.

These 236 documents were abstracted and 8 were subsequently discarded because of theme-mismatch or missing bibliographic

information, leaving 228 peer-reviewed articles for analysis. The data set was carefully selected and served as the basis for the following bibliometric analyses carried out by means of the VOSviewer (van Eck & Waltman 2010) and bibliometrix-compatible programs, such as co-citation mapping, construction of a keyword co-occurrence network, thematic clustering, and temporal production analysis. The following process is detailed view of applied research methodology:

#### **3.1 Research Design**

The present study uses a bibliometric research design to systematically analyze the intellectual structure, publication trend, and thematic development of the social sciences (SS) field of research regarding qualitative research on chatbots (Siddals et al. 2024). Bibliometric analysis is quantitative based methodology that employs statistical and citation tools to assess academic literature to determine influential authors, influential journals, countries, research themes, and emerging trends. The study adopts descriptive bibliometric analysis and science mapping methods to give a holistic decision of the evolution of qualitative research on chatting bots. The research is particularly centered on chatbot, conversational Artificial Intelligence, conversational agents, virtual assistants, ChatGPT and generative Artificial Intelligence research in the context of social sciences.

#### **3.2 Data Source**

Only data from Elsevier Scopus were accessed for bibliographic purposes. Scopus was chosen because it is one of the most comprehensive and dependable multidisciplinary databases that include high-quality peer-reviewed research articles in social sciences, business and management and technology related fields. The data contains the standard bibliographic data such as author(s), affiliation(s), abstracts, citations, and keywords, making the data very appropriate for bibliometric and science mapping studies.

#### **3.3 Search Strategy**

A thorough search strategy was developed to find relevant papers related to qualitative research papers on chatbot technologies. The search was made with the following search string: ((chatbot OR AI chatbot\* OR conversational AI OR virtual assistant\* OR conversational agent\* OR ChatGPT OR generative AI) AND (qualitative research)). To ensure comprehensive collection of relevant studies, a search string was created using a variety of synonymous keywords associated with the technologies related to chatbots and conversational AI. Different variants of the words were captured using the wildcard symbol, (\*). A total of 756 documents were obtained in the first search in the Scopus database.

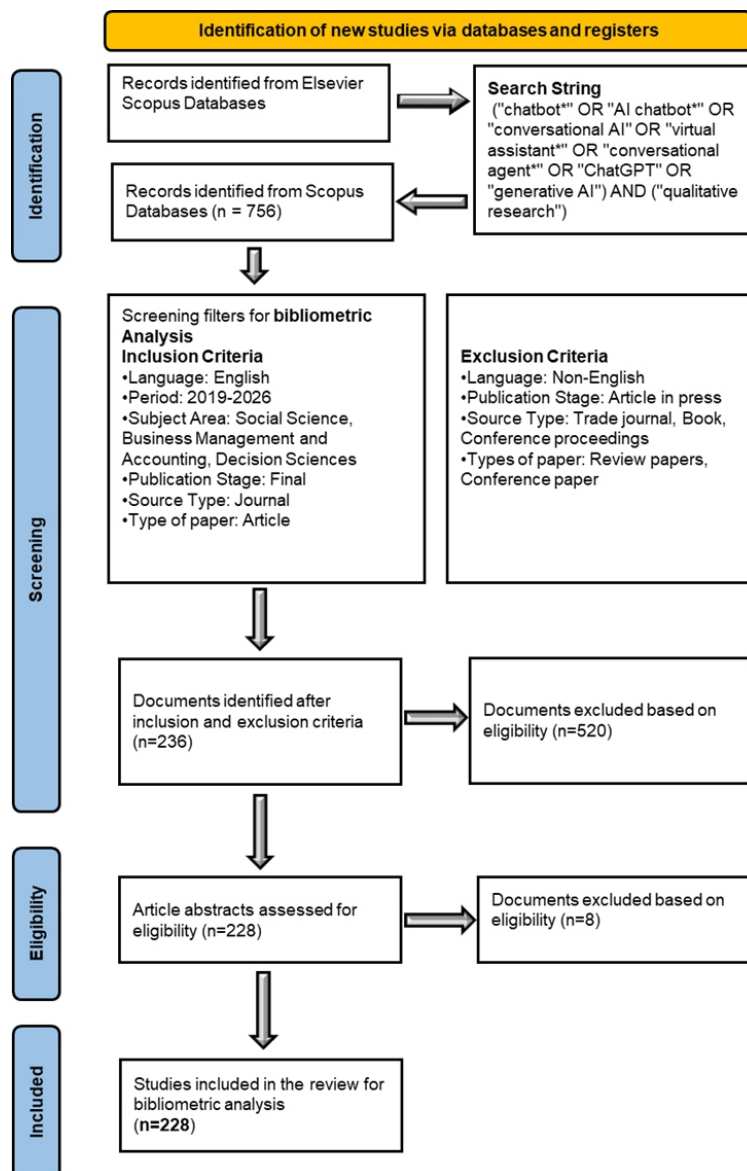
### 3.4 Inclusion and Exclusion Criteria

During the screening process, criteria for inclusion and exclusion were established to ensure that the data is relevant and of good quality. This study only considered English-language journal articles that appeared in the subject areas of Social Sciences, Business, Management and Accounting and Decision Sciences published from 2019 to 2026. The publications and original research articles were only analysed if they were the last documents. Concurrently, the non-English publications, articles under press, trade journals, conference papers, books, book chapters, review papers and conference papers were not included in the study. These criteria ensured thematic relevance, consistency and quality of the final set of data.

### 3.5 Screening and Eligibility Process

The screening and selection process was conducted according to PRISMA 2020 guidelines to ensure transparency and a systematic reporting of the process of study selection. The final number of documents selected for further evaluation was 236 documents after applying the inclusion/exclusion criteria. These publications were then followed up and abstracts carefully evaluated for acceptability and thematic appropriateness to the study's goals. In this phase there were 8 articles excluded due to not meeting the study's qualitative research focus. Therefore, a total of 228 journal articles published in journals indexed in Scopus were included in the final dataset for bibliometric analysis.

Figure 1: PRISMA Flow Chart



Source: Author's compilation

### 3.6 Data Analysis Techniques

Selected publications were analyzed comprehensively, using both descriptive bibliometric analysis and science mapping techniques. A descriptive bibliometric analysis was conducted on the number of publications published annually, the authors who had the greatest impact, the most influential journals, the most productive countries, the institutions that contributed the most, citations, and the most common keywords. These signs have aided in comprehending the evolution of qualitative research on chatbots. Science mapping tools were also applied to map the scientific and conceptual landscape of the research field. The analysis comprised co-authorship analysis, co-citation analysis, keyword co-occurrence analysis and thematic clustering. These techniques helped identify the main research themes, networks of collaboration and new directions in research.

### 3.7 Bibliometric tools and software

The bibliometric analysis was done using Bibliometrix and Vosviewer software. The dataset was analyzed descriptively, thematically, and in terms of performances using a bibliometric package, called Bibliometrix, which is based on R. For constructing and visualizing bibliometric networks, such as co-word analysis, VOSviewer was used. These software tools are well-known for bibliometric researchers with its efficiency and visualization.

## 4. RESULTS

### 4.1 Descriptive Analysis

#### 4.1.1 Main Information

The table shows the key bibliometric attributes of the dataset and highlights the rapid research field development and growth over the period 2019-2026 (refer to table 1). The total number of articles published in 156 academic journals suggests good distribution of journals and growing interest in the domain from academia. Overall research activity has been growing at a 66.85% rate per year, which reflects a high level of research activity in recent years. There are 746 authors: the average number of co-authors for each document is 3.39, indicating a collaborative and interdisciplinary research environment. A quarter of the authors (25.44%) are authors from two or more countries, indicating increased international academic collaboration. The average document age is 1.33 years, suggesting the impact of the documents is still relatively young, however the average number of citations per document is 18.67, which is an indication of the scholarly impact. Also, the volume of references, author keywords and Keywords Plus indicates conceptual variation and thematic richness in the field. The results show the overall picture as an emerging, but rapidly developing and globally interconnected research field.

Table 1: Main Information

Description	Results
<b>MAIN INFORMATION ABOUT DATA</b>	
Timespan	2019:2026
Sources (Journals, Books, etc)	156
Documents	228
Annual Growth Rate %	66.85
Document Average Age	1.33
Average citations per doc	18.67
References	26456
<b>DOCUMENT CONTENTS</b>	
Keywords Plus (ID)	607
Author's Keywords (DE)	755
<b>AUTHORS</b>	
Authors	746
Authors of single-authored docs	38
<b>AUTHORS COLLABORATION</b>	
Single-authored docs	38
Co-Authors per Doc	3.39
International co-authorships %	25.44
<b>DOCUMENT TYPES</b>	
article	228

Source: Author's compilation

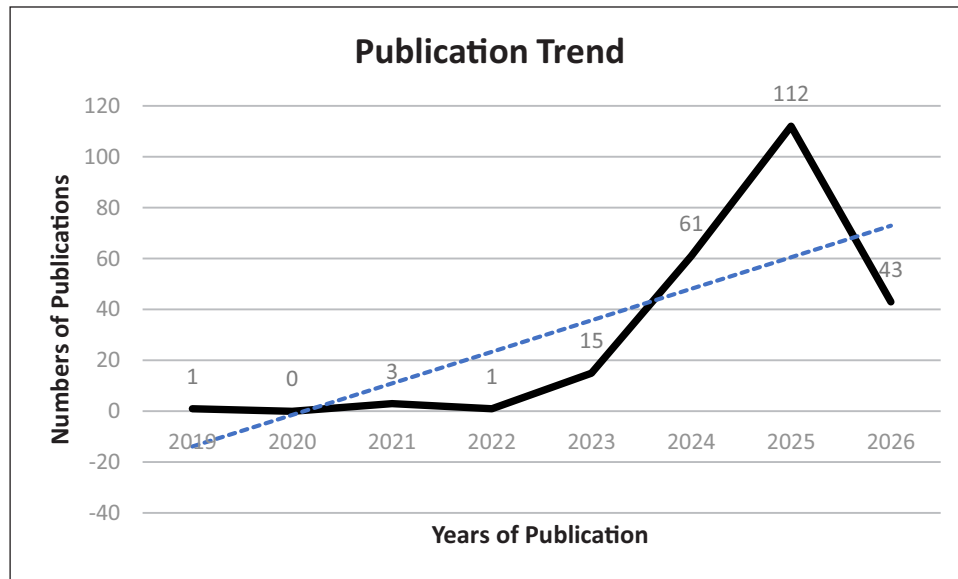
#### 4.1.2 Publication Trend

During the timeframe covered here, the number of scholarly works about chatbots, conversational AI and AI-based dialogue systems in the social sciences has grown significantly. The first stage of the dataset contained only few research works; one publication was found in 2019, none in 2020 and just two in 2022, which represents around 0.42% of the entire corpus. This trend reversed in 2023, with moderate growth up to 15 publications (6.36%) in that year, and then a sharp increase in 2024 to 61 publications (25.85%) in the same calendar year (refer to figure 2). The year with the greatest number of publications indexed was 2025, with 112 papers, or about 47.46% of the total, verifying that 2025 was the most productive year in the field to date. The output for 2026 showed 43 documents (18.22%) which although lower than the previous peak, still points to ongoing positive engagement with the subject.

The notable rise in research interests is closely aligned with the widespread introduction of large-scale generative AI platforms, notably ChatGPT, which has motivated interdisciplinary research interest in the experiential, ethical and social aspects of AI-enabled communication. The speed at which research is being published indicates the increasing academic appreciation of the role of qualitative methods in capturing nuances, lived experience, and contextual complexity and in interrogating

issues of trust, emotional response, ethical use, and societal consequence in human–AI interaction. The rising trend indicates that the landscape is transitioning into a conceptual stage of consolidation, offering more possibilities for interdisciplinary exploration into ethical governance, user behavior, affective involvement, and the social implications of conversational AI systems.

**Figure 2: Year-Wise Publication**



Source: Author's compilation

#### 4.1.3 Three-field Plot

The three-field visualisation illustrates the intellectual connection of the most prolific authors (AU), the most frequently used thematic keywords (DE) and the most important publications outlets (SO) in the social science body of literature regarding qualitative research on chatbots. The resulting diagram (figure 3) shows that constructs like ChatGPT, AI, Qualitative research, generative AI, and LLMs create dense conceptual links within and across individual scholars and across disciplinary journals, including education, health, and social sciences. The convergence is part of a shift in epistemological research orientations, from technocentric research modes to interpretive, socio-behavioural research modes.

The visualisation suggests that journals that have a strong tradition in qualitative research and educational work, such as journals related to nursing education, higher education, and academic integrity, are becoming more of a channel for new scholarship emerging from the field of AI. This thematic entanglement of educational journals with concepts of generative AI can be read as an indication of the norms and preferences of both publishers and readers that actively shape

the conceptual lexicon of the field. In the future, the high profile of journals rooted in qualitative inquiry suggests future scholarship will continue to focus on issues of ethics, user trust, affective involvement, and the social dimensions of the use of conversational agents in education and professional settings.

In this lesson, students learn about the process of writing as a series of events.

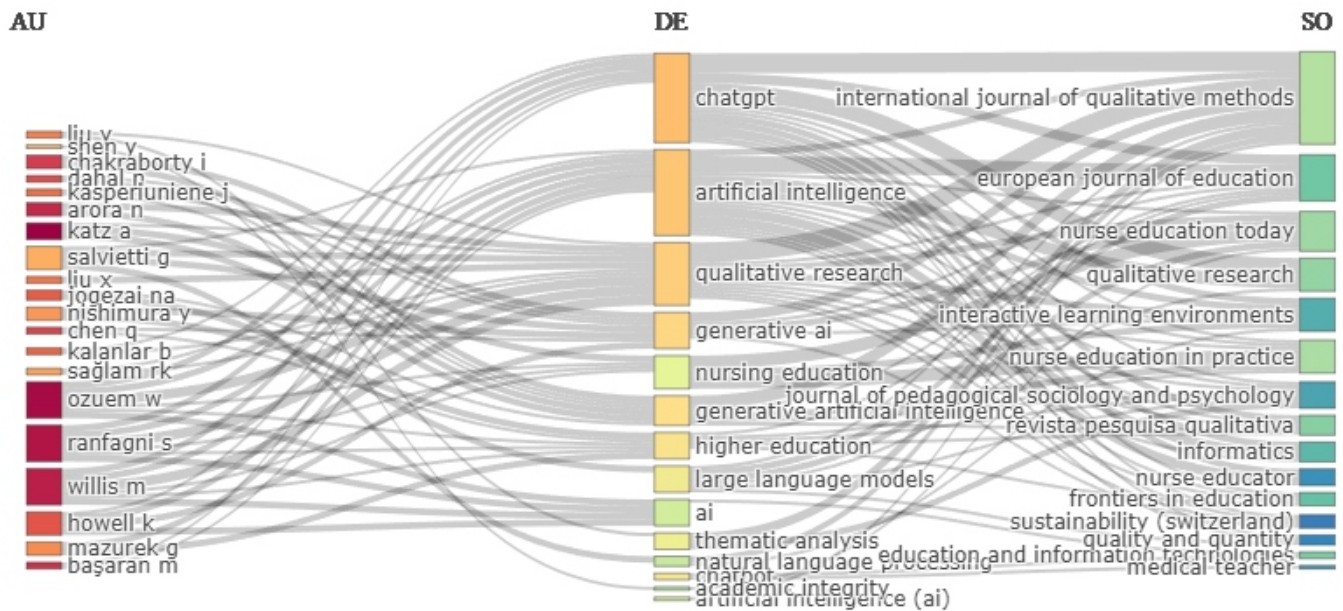
A temporal analysis of author productivity explores the development of individual scholarly outputs over the course of the analysis period, and shows that there is a small group of scholars with a strong impact, with the majority being more active in the years 2024–2026. This is a pattern found in a discipline in the early to middle stages of institutionalisation, and in which initial contributions are being made by 'radical' scholars before more widespread diffusion of research activity. Although the number of contributors is relatively small, citation figures show that some contributors have had a significant scholarly impact.

ARORA N is the only one to be cited 81 times and to have a citations-per-year ratio of 40.50, suggesting that it has been

highly cited and has quickly become part of the intellectual conversation in the field. Equally striking citation profiles are seen in the works of HOWELL K, OZUEM W, RANFAGNI S and WILLIS M, whose work seems to have played a decisive role in shaping the conceptual and methodological configuration of the field today. The temporal distribution also shows a growing trend of multi-authorship among the most influential authors, and thematization of qualitative research, generative AI, and

consumer or student experience. The presence of more recent years in the publications suggests a dynamic research field, with new scholars continuously bringing empirical and theoretical elements. The patterns in the trajectory of citations indicate the field is well poised to continue expanding internationally, to become more specialised, and to be more diverse in future research cycles.

Figure 3: Three Field Plot



Source: Author's compilation

#### 4.1.4. Most Relevant Source Analysis

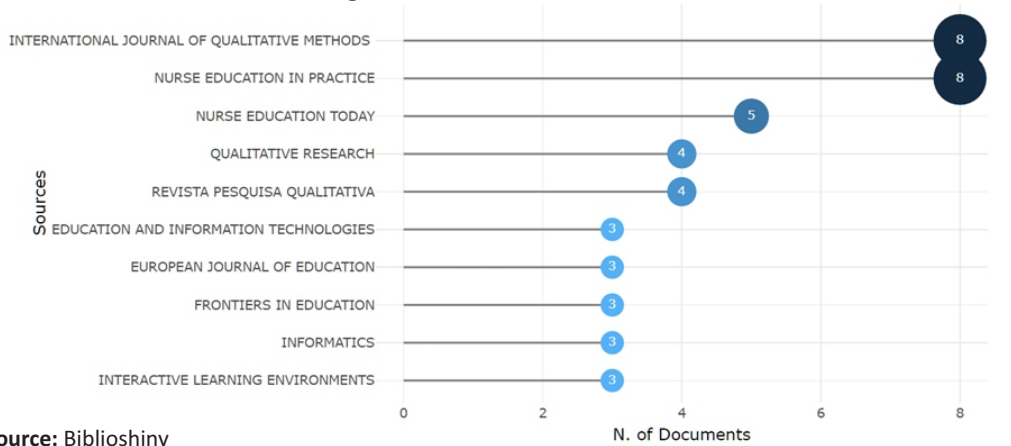
The publication source analysis identifies top journals that publish qualitative papers in the social sciences domain and focuses on chatbots, conversational AI, and generative AI (figure 4). The International Journal of Qualitative Methods and Nurse Education in Practice were the most productive journals in terms of the number of publications with 8 and 5 respectively, followed by Nurse Education Today with 5 publications. The prevalence of qualitative method-focused journals suggests a current thrust in the field of chatbot studies that is predominantly centered on human experiences, educational change and transformation, healthcare communication, and ethical interactions with AI.

The shift in publication pattern reveals a growing trend in research toward social science studies that are also human-centered and interdisciplinary, rather than technical. As the education and healthcare journals continue to proliferate, research into the future will likely involve further developments

in the areas of ethical governance, digital well-being, AI support for learning, emotional intelligence and qualitative investigation into how human-AI interaction is experienced in different social settings.

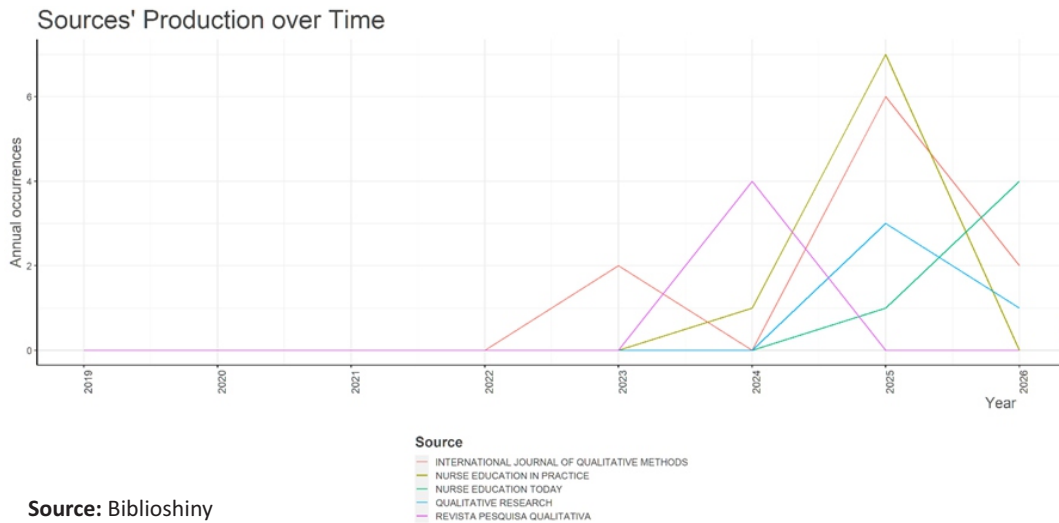
An increasing number of qualitative studies on chatbots and conversational AI can be observed in the source production over time (figure 5). There were not many publications published during 2019 to 2022, suggesting the nascent status of the field. Nevertheless, a sudden rise was seen for 2025 and 2026, especially in the journals like International Journal of Qualitative Methods, Nurse Education in Practice, and Nurse Education Today. Focusing on human experiences, ethical issues and learning and healthcare communication with the aid of AI shows a shift toward qualitative methodology research in the education and healthcare literature. The trend suggests opportunities for future interdisciplinary, human-centered qualitative research on the conversational AI technologies available around the world.

**Figure 4: Most Relevant Sources**



Source: Biblioshiny

**Figure 5: Sources Production Overtime**



Source: Biblioshiny

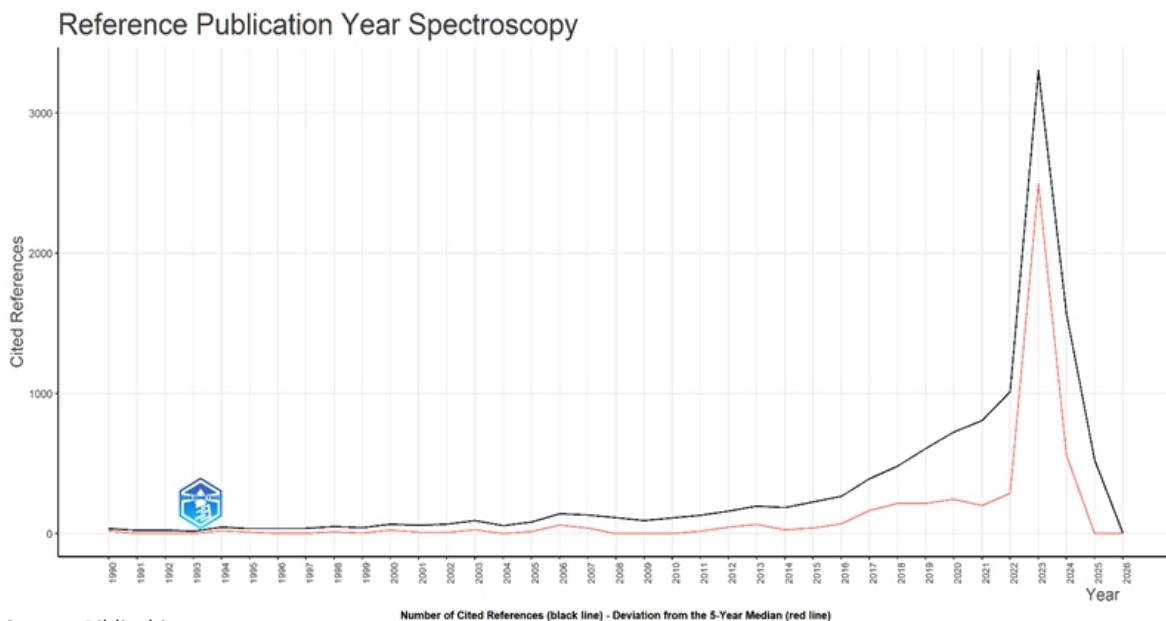
An increasing number of qualitative studies on chatbots and conversational AI can be observed in the source production over time. There were not many publications published during 2019 to 2022, suggesting the nascent status of the field. Nevertheless, a sudden rise was seen for 2025 and 2026, especially in the journals like International Journal of Qualitative Methods, Nurse Education in Practice, and Nurse Education Today. Focusing on human experiences, ethical issues and learning and healthcare communication with the aid of AI shows a shift toward qualitative methodology research in the education and healthcare literature. The trend suggests opportunities for future interdisciplinary, human-centered qualitative research on the conversational AI technologies available around the world.

#### 4.1.5 Reference Spectroscopy

The graph (figure 6) below showed the growth trend of the number of citations in the field over time. The number of

citations was very low from the eighteenth century to the mid-twentieth century, suggesting opportunities for scholarly interest and research development were relatively low during this early period. The small increase became apparent since the 1950s, and the large increase since 2000. The most significant growth was seen from 2016 to 2023, with the number of citations rising steeply to a high of 3304 citations in 2023. This steep increase is due to the growing interest in academic, rapid knowledge growth, technological advances, and interdisciplinary involvement in the field. The reduction for 2024–2026 is not necessarily a negative one, since typically the publications take time to build up citations. In general, the diagram indicates a field that is in a dynamic growth stage, is promising for future research, and provides possibilities for theoretical development, methodological development and interdisciplinary study.

**Figure 6: Reference Spectroscopy**



Source: Biblioshiny

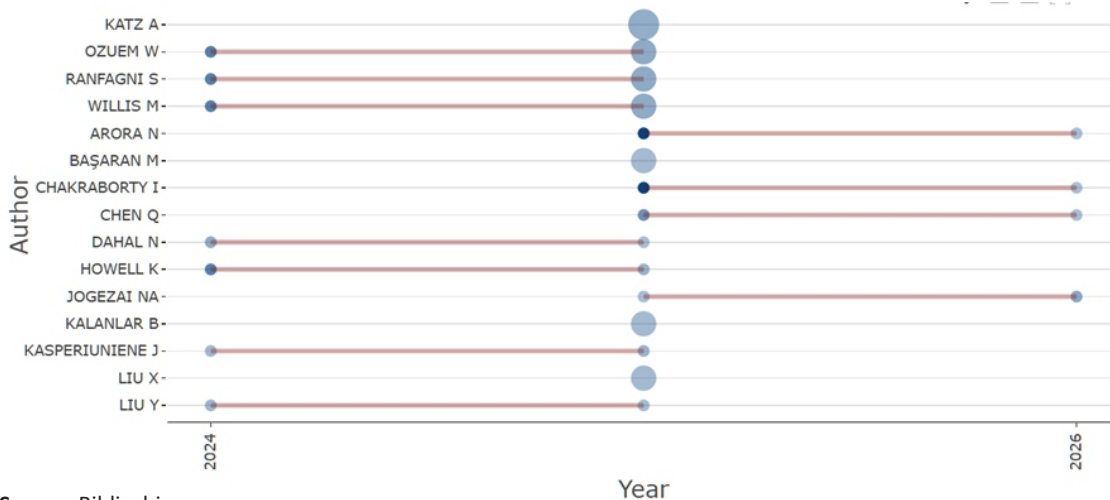
**4.1.6 Author's Production over time**

The graph shows the evolution of the scientific output of authors in the time frame studied with regard to the number of published items and the impact that these publications have on this scientific area (figure 7). The analysis shows that research activity is being focused by a small number of scholars in the period 2024-2026, highlighting that the field is still in a nascent and dynamic phase. However, there are authors who have exhibited a very high degree of citation influence, with ARORA N having a total of 81 citations and a respectable citations-per-year ratio of 40.500, indicating significant scholarly impact and visibility. Likewise, the citation performance of HOWELL K, OZUEM W, RANFAGNI S and WILLIS M are evident and significant, and it is possible to conclude that

they have played a crucial role in shaping the current discourse of the field.

The diagram also shows a growing focus on collaboration and themes by the more influential researchers. The dominance of recent publication years reflects the ongoing, ingoing, and burgeoning academic interest and development in the field. The results suggest that the field is a dynamic one as new researchers are contributing to the theoretical and empirical dimensions. Future research is indicated by the trend of good opportunities for interdisciplinary collaboration, development of new conceptual frameworks, and advanced methodological exploration. Recent authors' citation rates also show that the field is set for further growth, increased worldwide awareness, and increased specialization of study in the future.

**Figure 7: Author's Production Overtime**



Source: Biblioshiny

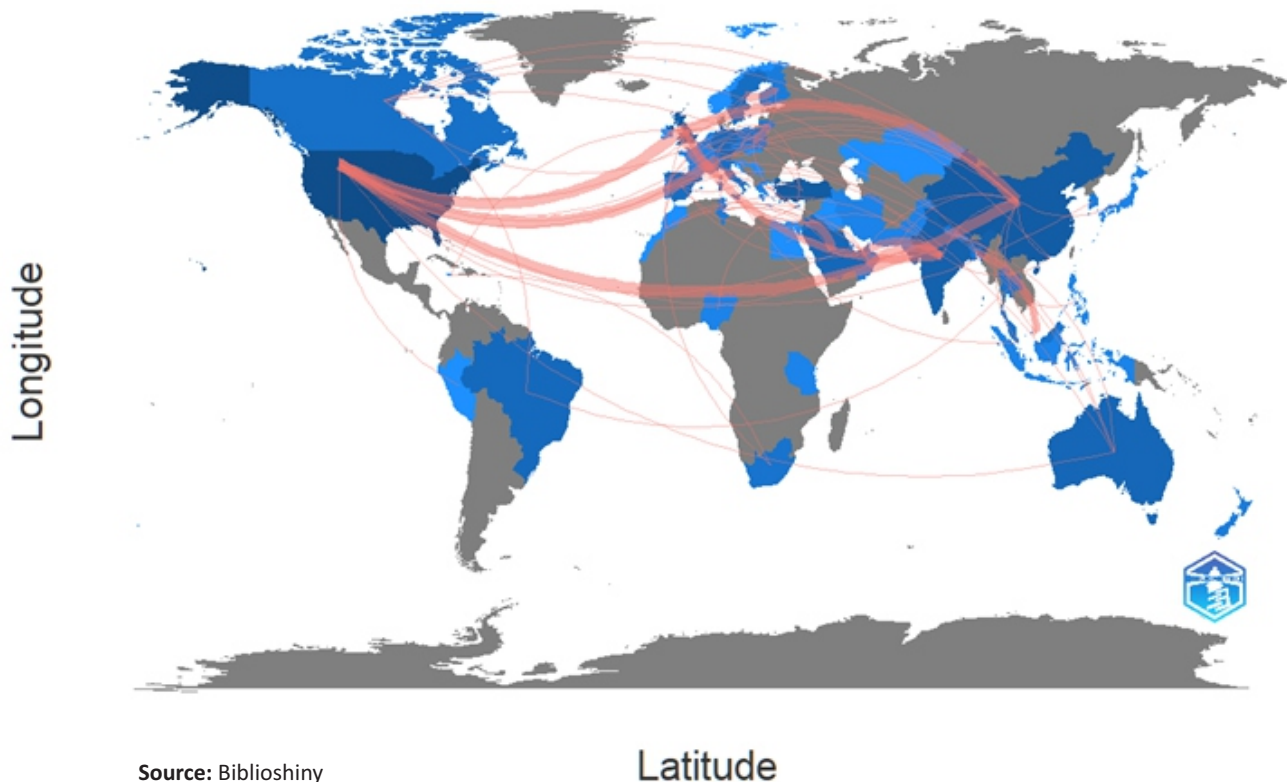
#### 4.1.7 Country's collaboration map

This country collaboration map illustrates how scholars from across the world collaborate and how interconnected the field is particularly highlighting cross national scholarly partnerships (figure 8). The collaboration network shows that countries like China, the United Kingdom, the United States, India, and the United Arab Emirates have a dominant role in international research collaboration. The development of academic partnerships and knowledge exchange between developed and emerging economies is also evident, with strong collaborative ties between China–United Kingdom, USA–China, USA–Switzerland, and United Kingdom–Italy. The inclusion of Asian, European, Middle Eastern and African countries further

demonstrates the emerging internationalization and multidisciplinary significance of the research field.

The nature of the collaboration indicates that the field is currently highly integrated and interdependent, with a high degree of knowledge sharing and academic exchanges between different cultures. This cooperative effort improves the quality of research and methodological diversity, as well as innovation (theory and empirical approaches) internationally. The growing network of collaboration suggests more potential for comparative research, collaborative research projects, interdisciplinary approaches, and cross-fertilization of results in the future, and this could enhance the intellectual growth and worldwide contributions of the discipline.

Figure 8: Country's Collaboration World Map



Source: Biblioshiny

#### 4.1.8 Affiliation Production over time

The affiliation production analysis revealed the diversity of institutions and the international academic involvement in the research field (figure 9). The data also show that leading universities and research institutions like Virginia Polytechnic Institute and State University, Harvard Medical School, Monash University, University of Cambridge and The Hong Kong Polytechnic University have made significant scholarly contributions, highlighting the increasing academic importance

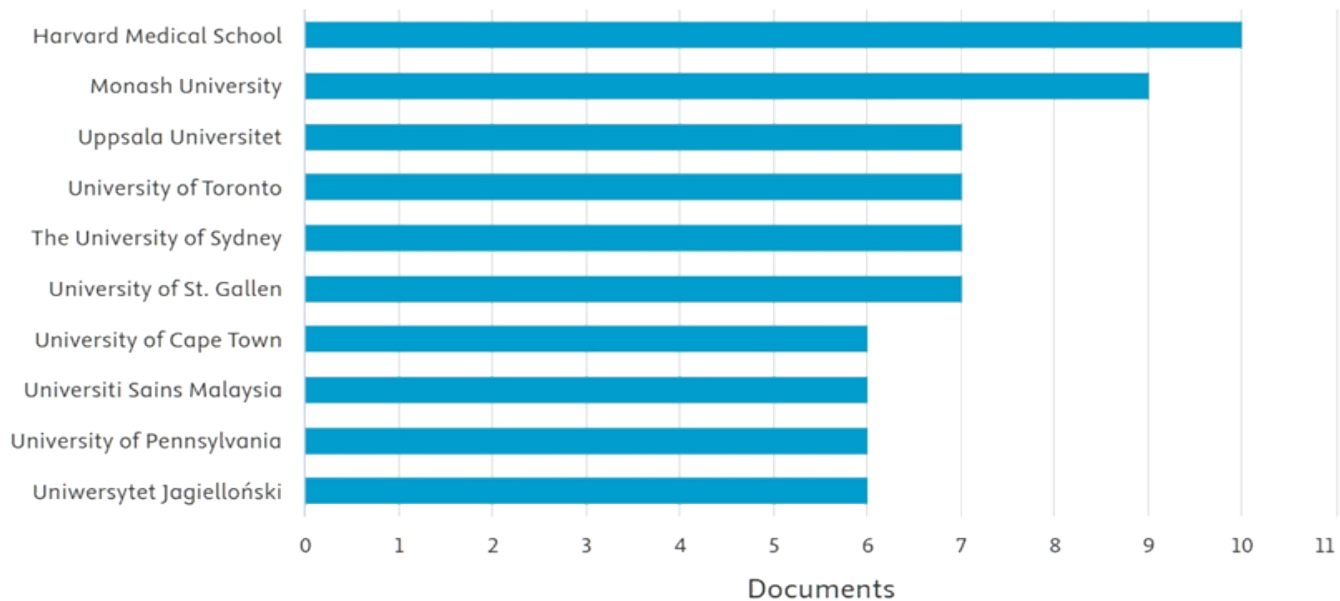
and multidisciplinary aspects of the field. Institutions are distributed all over the world, and the number of international institutions is rising, reflecting the diffusion of research activity and increased international engagement. In addition, the involvement of medical schools, engineering colleges, business schools, technological universities and social science organizations indicates that the field is very interdisciplinary and involves researchers from a variety of academic disciplines.

The cooperation between the recognized institutions suggests

that the research interest in the topic has gained considerable scholarly reputation and momentum in the current time frame. The growing institutional engagement suggests that there is a great potential for future interdisciplinary innovations, international research collaborations, methodological

improvements, and further theoretical development. It further indicates that, in the near future, the field will witness further academic growth and integration of research from the rest of the world.

**Figure 9: Affiliation's Production Overtime**



Source: Author's compilation

#### 4.1.9 Most Globally Cited Documents

Most of the texts cited in the global context analysis can be identified as seminal texts that contributed to the intellectual history of qualitative research on chatbots and conversational AI in the social sciences (table 2). The most influential work is that of Cecilia Ka Yuk Chan (2023) with 1,060 total citations (TC), 265.00 citations per year (TCPY), and 40.9 field-weighted citation impact (FWCI) as shown in Table 2, indicating a remarkable disciplinary impact and reception of her work in the field. Comprehensive AI policy frameworks for university teaching roles pedagogical discourse at the centre of the field was the focus of this paper.

The second most cited (216 citations and FWCI of 33.7) paper is by Pongsakorn Limna et al. (2023), published in the Journal of Applied Learning and Teaching, on ChatGPT in the Digital Era, and the third most cited paper by Emmanuel Mogaji et al. (2021), published in Telematics and Informatics, with 198

citations and FWCI of 22, focused on consumer interaction with AI. In this respect, the 2024 study by Mohammad H. Al-Khresheh in Computers and Education: Artificial Intelligence reported a higher TCPY of 48.33, indicating a rising rate of citation of research on AI in language learning.

Overall, the citation statistics suggest that research on education, qualitative inquiry, and the socio-technical impacts of AI is being cited more than other types of research. There is a wide variation in the impact registered by the different FWCI scores, ranging from 2.92 to 40.9, and from education-oriented to policy-oriented contributions. Works from journals like Library Hi Tech News, Journal of Marketing, and Critical Perspectives on Accounting highlight the interdisciplinary nature of this collection. These books are identified as "foundational" nodes within the citation networks analyzed in the following co-word and thematic analyses.

**Table 2: Most global cited documents**

Rank	Title	Year	Authors	Journal	TC	TCPY	CD	CCY	CGS	FWCI
1	A comprehensive AI policy education framework for university teaching and learning.	2023	Cecilia Ka Yuk Chan	International Journal of Educational Technology in Higher Education.	1060	265.00	353.33	489	2408	40.9
2	The Use of ChatGPT in the Digital Era: Perspectives on Chatbot Implementation	2023	Pongsakorn Limna, Tanpat Kraiwanit, Kris Jangjarat, Prapasiri Klayklung	Journal of Applied Learning and Teaching.	216	54.00	72.00	37	408	33.7
3	Emerging-market consumers' interactions with banking	2021	Emmanuel Mogaji, Janarthanan Balakrishnan, Arinze Christian Nwoba, Nguyen Phong Nguyen	Telematics and informatics. Almost. Wow.	198	33.00	39.60	35	340	22
4	Bridging technology and pedagogy from a Global lens: Teachers' perspectives on integrating Chatgpt in English language teaching	2024	Mohammad H. Al-khresheh	Computers and Education: Artificial Intelligence.	145	48.33	72.50	65	333	13.5
5	Exploring the use of AI in qualitative Analysis: A comparative study of guaranteed income data.	2023	Leah Hamilton, Desha Elliott, Aaron Quick, Simone Smith, and Victoria Choplin	International Journal of Qualitative Methods	121	30.25	40.33	53	259	4.67
6	Exploring the viability of Chatgpt as an alternative to traditional chatbot systems in library and information centers	2023	Subhajit Panda and Navkiran Kaur	Library Hi Tech News	87	21.75	29.00	15	183	17.1
7	Identifying the Opportunities and Challenges of Artificial Intelligence in Higher Education: A qualitative study	2023	Fate,e Jafari and Ahmad Keykha	Journal of Applied Research in Higher Education.	84	28.00	28.00	45	183	2.92
8	AI-Human hybrids for marketing research: Leveraging large language models as collaborators	2024	Neeraj Arora, Ishita Chakraborty and Yohei Nishimura	Journal of Marketing	81	40.50	27.00	72	203	35.8
9	Utilizing artificial intelligence, enhanced writing in mediation to develop academic writing skills in EFL learners: A qualitative study	2026	Jalil Fathi and Masoud rahimi	Computer Assisted Language Learning.	78	78.00	26.00	56	151	25.3
10	Artificial intelligence and qualitative research. The promise and perils of large language model (LLM) 'assistance'	2024	John Roberts, Max Baker, Jane Andrew	Critical Perspectives on Accounting	73	24.33	24.33	36	137	36.4

**Notes:** TC: Total Citations, TCPY: Total Citations per Year, CD: Citations Density, CCY: Citations in Current Year, CGS: Citation Count on google Scholar, FWCI: Field Weighted citation Impact

## 4.2 Science Mapping

### 4.2.1 Word Cloud Analysis

The word cloud visualisation (Figure 10) offers an intuitive overview of the lexical landscape of the most frequently used

author assigned keywords across the 228 articles that make up the analytical corpus, outlining the conceptual field of qualitative research on the topic of chatbots and conversational AI in the social sciences. The term prominence is correlated with

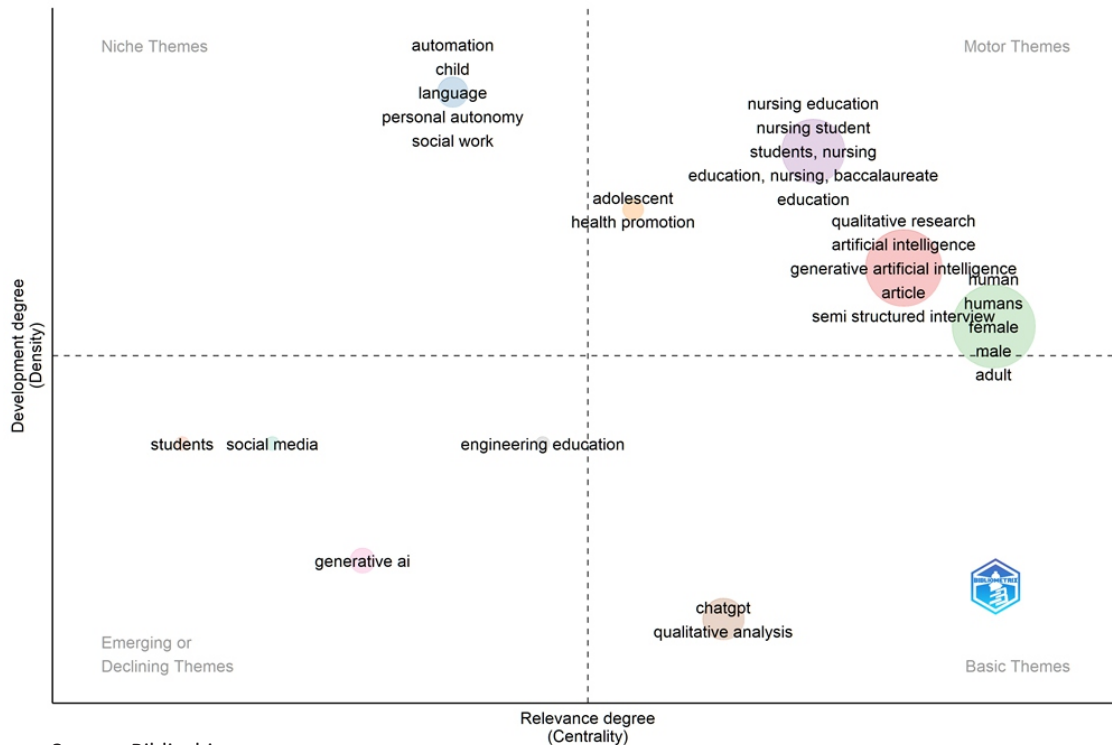




The other themes found in the upper left quadrant, such as automation, child, language, personal autonomy, and social work, are generally peripheral to the field and are not very central or dense. Niche Themes are a group of topics with high internal density but not much centrality, which appear to be specialised, relatively self-contained sub-literatures. New or Waning Themes in the lower left-hand corner, like generative ai, students, and social media, can indicate emerging trends that

are still in the process of coalescing for conceptualization or waning scholarly interest. Themes in the lower right—chatgpt, qualitative analysis, human, and adult—are extremely central but underdeveloped and serve as basic constructs that can be further developed theoretically. This thematic cartography offers an intelligent direction for future academic investments in the field.

**Figure 12: Thematic Map**



Source: Biblioshiny

## 5. Discussion

The results of this bibliometric and science mapping study collectively outline a research arena characterised by intellectual transition, which has, in a relatively brief period, shifted from a concerned peripheral role in scholarly research to a flourishing, self-aware and methodologically sophisticated research field Donthu et al. (2021). This picture is composed of each analytical dimension, which provides its own dimension of meaning, and it is the collection of these dimensions that help point to a set of structurally significant implications for the future of qualitative human–AI interaction research in the social sciences. This is why it is important to understand the different patterns of intellectual authority and to know how to cite them.

### 5.1 Intellectual Structure and Citation Patterns

The most widely referenced documents analysis confirms that the intellectual intersections in this field are overwhelmingly

found within the broad category of AI policy, pedagogy and qualitative inquiry. The high citation impact of Chan (2023) (FWCI = 40.9) and Limna et al. (2023) and Mogaji et al. (2021) suggest that there has been a concentration on foundational work in educational transformation and consumer facing AI interactions. Education scholars tend to write in journals and magazines dedicated to education and policy issues, rather than in technical journals, suggesting that the intellectual power of the field is being built on practical, humanistic arguments, not technical ones. This means that future high impact scholarship in this area is likely to continue to focus on context oriented and interpretive approaches rather than quantitative approaches to performance benchmarking.

### 5.2 Conceptual Vocabulary and Methodological Orientation

It is highly recommended that teachers and students acquire the necessary conceptual vocabulary and methodological

orientation based on the following: This pattern is echoed in the word cloud analysis, which shows a rich mix of qualitative techniques (e.g., semi-structured interviews, thematic analysis, and focus groups) alongside terms related to the technology (ChatGPT, generative AI). Empirical settings in the top ten include nursing education and health professional training, indicating that the primary applied space for the field is healthcare education – an important insight for digital health governance and curriculum. The reoccurrence of Ethics, Trustworthiness, and Academic Integrity as keyword constructs indicates that the issues of ethics and trustworthiness and academic integrity are starting to become part of the conceptual language of the field, not just incidental.

### **5.3 The role of structural architecture in the field:**

This structural reading is confirmed by the co-word network analysis. The high interdependence of the components of the network in the areas of chatgpt, qualitative research, and education suggests a triple intellectual structure, where the three components are mutually defining. In addition to the health informatics cluster (which includes medical education, digital health and mHealth), there is an ethics-oriented cluster of which cheating, academic integrity and teacher education represent sub-domains. This differentiation suggests that one might be able to work within thematically related but separate communities of inquiry, developing thematically specific theory and practice. Peripheries of nodes like older adults, digital transformation, and frustration-aggression theory suggest under-explored lines of work that are real opportunities for novel contribution.

### **5.4 Strategic Thematic Positioning**

Perhaps most tellingly then is the thematic map analysis. As the most structurally established and advanced strands of the field, it is anticipated that qualitative research, AI, and nursing education will continue to make, and receive, scholarly strides and funding over time. In contrast, generative AI and social media make their presence in emerging themes, indicating that these topics are not sufficiently theoretically rich to establish a coherent research agenda yet. Basic Themes are constructs with broad disciplinary appeal that have received limited theoretical attention, and they are a space into which a scholar can make a theoretically innovative contribution most simply: highly central yet underdeveloped, the space of Basic Themes is one that is shared by most disciplines but minimally theorized. The analytical results from both studies suggest a promising field that is both productive and inter-national connected, but still largely lacking in conceptual cohesion.

## **6. Future Research Directions**

The outcomes from this research shed light on several areas of future important qualitative research on chatbots and conversational AI in the social sciences. The rise of generative AI and social media as thematically underserved fields in the thematic map reflects both the need for more in-depth, theoretically robust qualitative research which goes beyond educational contexts and raises questions regarding the social, relational and ethical dimensions of LLMs-as-conversational-agents, and the requirements for such approaches to be made popular. First, the themes of generative AI and social media in the thematic map expose the need for more in-depth and theoretically grounded qualitative studies that question social, relational and ethical aspects of LLMs-as-conversational-agents beyond education, and for this to become popular, even as well as more necessary. There are specific types of qualitative longitudinal designs, such as ethnographic studies, diary methods, and repeat-interview designs that require singularly to explain how trust is formed, how emotional dependence is fluctuating between the human and AI agents, and how identities are negotiated over time in enduring relationships between human and AI agents, all of which are revealed by the interrelated facets of these and more. There are specific types of qualitative longitudinal designs that can be justified to capture the temporal dynamics of trust formation, of emotional dependence between the human and AI agents, and of identity negotiation throughout the relationship, such as ethnographic studies, diary methods, and repeat-interview approaches, which are structurally not possible to capture in a cross-sectional study.

Second, though, the prominence of nursing and health education as empirical fields or contexts is a sign of fruitful investment in research, and a sense of relative neglect in other key social fields. There is a need to continue the qualitative investigation of the chatbot on topics of social work, legal services, civic participation, financial counselling and community mental health; where the ethical issues of interaction with an AI are just as prominent and less studied. Overall, personal autonomy, child orientations, and the thematic map's niche positioning of social work highlight the importance of qualitative research focusing on vulnerable groups and the (in)equality dimensions in human-AI relationships.

Third, the country collaboration map shows that the partnerships internationalization process is still underway, with some geopolitical regions still being structurally out-of-the dominant international collaboration networks, such as Sub-

Saharan Africa, Latin America and South and Southeast Asia. Qualitative research that claims a “cultural” perspective with cultural contexts, such as comparative cross-national studies based on postcolonial and decolonial approaches, is necessary to make sure that knowledge production in the field does not remain sidelined within Western and East Asian academic traditions, but is grounded in the field's users lived experiences. Finally, methodological meta-research in the field (systematic reviews and methodological audits of qualitative studies of chatbots) will be required in order to identify common methodological aspects of rigour, trustworthiness and reflexivity in this rapidly evolving area.

## **7. Implications**

### **7.1 Theoretical Implications**

From a theoretical point of view, the results presented in this research also help to further the theoretical knowledge about human–AI interaction in the social sciences. The use of the term Motor Theme to identify qualitative research, artificial intelligence, and nursing education means that the field is developing intellectual orientations working in humanistic, interpretive rather than computational or systems-based approaches. This has ramifications for understanding the social agency, social relationship and communicative ethics of conversation with AI systems. The central triangle of the co-word network—chatGPT, qualitative research, education—indicate that the development of a new theoretical paradigm is still under way, an AI-centric one that combines the ideas behind the socio-constructivist learning theories, phenomenology, and critical assessments of how humans interact with machines, with the ideas behind the governance of AI. Over the coming years, this synthesis should be formalized in some way, possibly by further building the mid-range theories of AI mediated communication that take account of the context, power, and intersubjectivity. Moreover, the structural integration of ethical concerns, trust and academic integrity, as fundamental or non-negotiable components of the thematic positioning on the ethics, trust and academic integrity of AI chatbots, points towards a more cognitive change through the growing importance of qualitative chatbot research in conceptualizing the ethics, trust and academic integrity of AI chatbots in theory building. It places the field in a prominent role in the general discussions of Science and Technology Studies, critical AI studies and the Philosophy of Human-machine Relations.

### **7.2 Practical Implications**

The implications of these findings have meaningful implications at multiple levels of institutional policies. Future directions in

educational use of AI are evident in the way that the limited and focused high impact scholarship uses AI methods in education, especially health professional and nursing education. Qualitative insights into students' levels of trust, discomfort with the use of AI in writing assignments, and the students' perceptions of the authenticity of AI-generated feedback should inform the development of policies related to the use of AI in writing assignments, as these policies will differ significantly from an absolute ban or an overly optimistic adoption. Academic institutions should make use of the qualitative results that showed students' bias towards trust, discomfort, and perceiving the feedback as authentic or fake generated by AI and draft policies, especially when it comes to using AI for writing tasks, and refrain from regarding them as a blanket prohibition or an optimistic approach. Academic integrity is a consistent thematic concern, suggesting that changes need to be made at the institutional level: Investing in qualitative, dialogue-based approaches is needed to comprehend students' motivations and experiences of using AI to assist in their completed work, as well as specific compliance-oriented measures for detecting plagiarism. The creation of a distinct healthcare cluster of the co-word network highlights the necessity of healthcare organisations and digital health developers to consider qualitative user research as a key component when creating, deploying and evaluating conversational AI systems in clinical and health education settings. It is evident that patient experience, clinical trust, and the emotional labour of AI-mediated care, are the dimensions not captured by quantitative testing and should be included through structured qualitative evaluation process in healthcare AI governance frameworks. Regarding the policy level, the globalization of collaboration network implies a shift to. Supranational regulatory authorities and research funding agencies and an increased attention to comparative qualitative research that can contribute to the creation of culturally sensitive AI governance principles.

## **8. Conclusion**

A thoroughly curated set of Scopus-indexed articles published between 2019 and 2026 (N = 228) is used for the first comprehensive bibliometric and science mapping analysis of qualitative research on chatbots and conversational AI in the social sciences field. The document identified a field in development and expansion for generative AI, driven by the recent AI paradigm shift represented by tools such as ChatGPT, and in a sense, a field distinctly bent toward humanistic, interpretive inquiry in the education and healthcare sectors. Qualitative study of chatbots has established meaningful intellectual coherence, as demonstrated by the most globally cited works, by keyword co-occurrence networks (KCNs), and

the thematic mapping, with rich Motor Themes in qualitative methodology, nursing, and education, and other Basic and Emerging Themes waiting to be theorised. The study's findings are thus threefold: it offers a fully-fledged bibliometric profile of an under-researched tradition of scholarship; it highlights key, promising avenues for future qualitative research; and it provides theoretically-informed, yet practical, recommendations for scholars, members of the education sector, practitioners, and policymakers grappling with the social implications of conversational AI. The interpretive knowledge provided by qualitative social science studies will be essential in securing the accountability, equity and humanization of the development of LLM based conversational agents as they increasingly become entrenched in social institutions.

### 8.1 Limitations

There are a number of limitations that should be noted in this study. The exclusive use of the Scopus database data source implies an exclusive use of data in Scopus exclusively, which leads to an inevitable loss of scholarship indexed only in discipline-specific databases, such as Web of Science, ERIC and Psy INFO, resulting in a source selection bias. In the second place, the inclusion criteria defining the corpus (English-language publications), can serve as a source of possible underrepresentation of findings, as it can bias towards English-language human-human or human-machine interaction tasks, but may underrepresent qualitative chatbot scholarship from the non-Anglophone research traditions, especially those developed in Latin America, continental Europe, and Asia. Third, since citations are drawn only back a reasonable number of years, recent articles (from 2025 and 2026 in particular) are likely underrepresented in the citation-based analysis, and thus the impact of the newer contributors is underestimated. Finally, because of the nature of bibliometric techniques, they only reflect structural and quantitative aspects of the literature and do not evaluate its epistemological quality, methodological rigor or theoretical depth. Despite these problems, the study offers a solid introduction to the intellectual history of the field, if not an exhaustive one, developed systematically.

## References

- Abd-Alrazaq, A. A., Alajlani, M., Alalwan, A. A., Bewick, B. M., Gardner, P., & Househ, M. (2019). *Chatbots for mental health: A scoping review of the features*. *International Journal of Medical Informatics*, 132, 103978. <https://doi.org/10.1016/j.ijmedinf.2019.103978>
- Adamopoulou, E., & Moussiades, L. (2020). *Introduction to Chatbot technology*. *IFIP Advances in Information and Communication Technology*, 584, 373–383. [https://doi.org/10.1007/978-3-030-49186-4\\_31](https://doi.org/10.1007/978-3-030-49186-4_31)
- Al-Shafei, M. (2025). *An exploration of factors affecting user satisfaction and engagement in human-chatbot interactions*. *International Journal of Human-Computer Interaction*, 41(1), 411–428. <https://doi.org/10.1080/10447318.2023.2301252>
- Androutsopoulou, A., Karacapilidis, N., Loukis, E., & Charalabidis, Y. (2019). *Transforming the communication between citizens and government through AI-guided chatbots*. *Government Information Quarterly*, 36 (2), 358–367. <https://doi.org/10.1016/j.giq.2018.10.001>
- Araujo, T. (2018). *Chasing the "bot hype": How anthropomorphic design elements and communicative agency framing affect the perceptions of conversational agents and companies*. *Computers in Human Behavior*, 85, 183–189. <https://doi.org/10.1016/j.chb.2018.03.051>
- Aria, M., & Cuccurullo, C. (2017). *Bibliometrix: A comprehensive science mapping analysis R-tool*. *Journal of Informetrics*, 11 (4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>
- Ayanwale, M. A., Olatunbosun, S. O., & Bamiro, N. B. (2026). *Bibliometric mapping of neural network research in education*. *Discover Education*.
- Bozkurt, A. (2023). *The inevitable paradigm shift in education, with generative artificial intelligence (AI) powered conversational educational agents*. *Asian Journal of Distance Education*, 18 (1), 198–204.
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). *How to Perform a bibliometric analysis: overview and guidelines*. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koochang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., ... Wright, R. (2023). *Sure, "so what if ChatGPT wrote it?" Multi-disciplinary view on opportunities, challenges and implications of generative conversational AI for Research, Practice and Policy*. *International Journal of Information Management*, 71, 102642. <https://doi.org/10.1016/j.ijinfomgt.2023.102642>
- Følstad, A., Law, E. L. C., & van As, N. (2024). *The impact of task order and the criticality of the task on user trust and emotion in the event of the breakdown of conversation in a customer service chatbot*. *ACM Transactions on Computer-Human Interaction*, 31 (5), 1–52. <https://doi.org/10.1145/3652599>

- Haenlein, M. and Kaplan, A. (2019). A short history of artificial intelligence: The history of AI - past, present, and future. *California Management Review*, 61 (4), 5–14. <https://doi.org/10.1177/0008125619864925>
- Han, Q., & Zhao, C. (2025). A bibliometric analysis of the potential of chatbots in mental health. *Frontiers in Psychiatry*, 16, 1494355. <https://doi.org/10.3389/fpsy.2025.1494355>
- Han, X., & Zhao, X. (2025). Chatbots and mental health: A bibliometric analysis (2015–2024). *Journal of Medical Internet Research*, 27, Article e58932. <https://doi.org/10.2196/58932>
- Kasneji, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., ... Kasneji, G. (2023). ChatGPT for good? The Opportunities and Challenges of LAMs in Education. *Learning and Individual Differences*, 103, 102274. <https://doi.org/10.1016/j.lindif.2023.102274>
- Khosravi, H., Shafie, M. R., Hajiabadi, M., Raihan, A. S., & Ahmed, I. (2023). A bibliometric analysis and systematic review of publications in Web of Science and Scopus databases related to Chatbots and ChatGPT. *International Journal of Data Mining, Modelling and Management*, 16 (2), 113–147. <https://doi.org/10.1504/IJDM.2024.138824>
- Kusal, S., Patil, S., Choudrie, J., Kotecha, K., Mishra, S., & Abraham, A. (2022). AI-based conversational agents: From technologies to future directions - A scoping review. *IEEE Access*, 10, 92337–92356. <https://doi.org/10.1109/ACCESS.2022.3201144>
- Laestadius, L., Bishop, A., Gonzalez, M., Illeňík, D., & Campos-Castillo, C. (2024). Too human and not human enough: A grounded theory analysis of mental health harms of emotional dependence on social chatbot Replika. *New Media & Society*, 26 (10), 5923–5941. <https://doi.org/10.1177/14614448221142007>
- Limna, P., Kraiwani, T., Jangjarat, K., Klayklung, P., & Chocksathaporn, P. (2023). The use of ChatGPT in the digital era: Perspectives on chatbot implementation. *Journal of Applied Learning and Teaching*, 6(1), 64–74. <https://doi.org/10.37074/jalt.2023.6.1.7>
- Lin, C.-C., & Yu, A. Y. (2024). Educational chatbots and students' learning outcomes: A systematic review. *Educational Technology & Society*, 27(1), 1–18.
- Lin, Y., & Yu, Z. (2024). A bibliometric study of the use of artificial intelligence (AI) chatbots in education. *Interactive Technology and Smart Education*, 21 (2), 189–213.
- Mogaji, E., Balakrishnan, J., Nwoba, A. C., & Nguyen, N. P. (2021). Emerging-market consumers' interactions with banking chatbots. *Telematics and Informatics*, 65, Article 101711. <https://doi.org/10.1016/j.tele.2021.101711>
- Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social reactions to computers. *Journal of Social Issues*, 56 (1), 81–103. <https://doi.org/10.1111/0022-4537.00153>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, Article n71. <https://doi.org/10.1136/bmj.n71>
- Ramya, J. B., & Alur, S. (2023). A bibliometric analysis of the potential of chatbots for business. *Journal of Information Science*. Advance online publication. <https://doi.org/10.1177/02663821231189344>
- Rapp, A., Curti, L., & Boldi, A. (2021). Ten-year comprehensive literature review of text-based chatbots—the human side of human-chatbot interaction. *International Journal of Human-Computer Studies*, 151, 102630. <https://doi.org/10.1016/j.ijhcs.2021.102630>
- Siddals, S., Torous, J., & Coxon, A. (2024). Experiences of generative AI chatbots for mental health. *npj Mental Health Research*, 3, Article 52. <https://doi.org/10.1038/s44184-024-00097-4>
- Skjuve M, Følstad A, Brandtzaeg PB. (2022). The questionnaire study of the user experience of ChatGPT. In *Proceedings of the 4th International Conference on Conversational User Interfaces* (Article 33). <https://doi.org/10.1145/3543829.3543875>
- Tanwar, P., & Verma, M. (2024). Bibliometric analysis of literature on chatbots. C. K. Shekhawat, "Fluctuation in water levels at the boundaries of the Abney-Carter type wells," *International Journal of Mathematical, Engineering and Management Sciences* 9(2), 323–340, <https://doi.org/10.33889/IJMEMS.2024.9.2.017>.
- Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). The devil is my guardian angel: ChatGPT as a case study of adopting Chatbots in education. *Smart Learning Environments*, 10(1), 15. <https://doi.org/10.1186/s40561-023-00237-x>
- van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>

- Weizenbaum, J. (1966). *ELIZA—A computer program for the study of natural language communication between man and machine*. *Communications of the ACM*, 9(1), 36–45. <https://doi.org/10.1145/365153.365168>
- Wirtz, J., Patterson, P. G., Kunz, W. H., Gruber, T., Lu, V. N., Paluch, S., & Martins, A. (2018). *Brave new world: Service robots in the frontline*. *Journal of Service Management*, 29(5), 907–931. <https://doi.org/10.1108/JOSM-04-2018-0119>
- Xu, Y., Niu, N., & Zhao, Z. (2023). *Unpacking the joint impacts of human-customer service chatbot interaction on customer satisfaction*. *Journal of Retailing and Consumer Services*, 74, 103417. <https://doi.org/10.1016/j.jretconser.2023.103417>
- Zupic, I., & Čater, T. (2015). *Bibliometric in Management and Organization*. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>

# AI-Based Automation, Data Analytics Capability and Supply Chain Performance: An Empirical Study of Logistics Companies in Uttarakhand

\*Tushar Dhiman

\*\*Pankaj Madan

## Abstract

*The rapid advancement of Artificial Intelligence (AI) and data-driven technologies has significantly transformed modern logistics and supply chain operations. Logistics companies are increasingly adopting AI-Based Automation and Data Analytics Capability to improve operational efficiency, reduce costs, optimize inventory management, and enhance overall supply chain performance. The present study investigates the impact of AI-Based Automation and Data Analytics Capability on Supply Chain Performance among logistics companies operating in Uttarakhand. The study adopts a quantitative and explanatory research design and utilizes primary data collected from 350 respondents working in logistics and supply chain-related organizations. A structured questionnaire consisting of 30 Likert scale items was used for data collection. The collected data were analysed using IBM SPSS Statistics through reliability analysis and regression analysis techniques. The reliability analysis revealed a Cronbach's Alpha value of 0.997, indicating an exceptionally high level of internal consistency and reliability among the study variables. Regression analysis findings demonstrate that AI-Based Automation has a significant positive impact on Supply Chain Performance with an R Square value of 0.958 and a standardized beta coefficient of 0.646. Similarly, Data Analytics Capability also shows a significant positive influence on Supply Chain Performance with an R Square value of 0.937 and a beta coefficient of 0.968. Furthermore, multiple regression analysis confirmed that AI-Based Automation and Data Analytics Capability collectively exert a strong positive impact on Supply Chain Performance. The findings indicate that intelligent automation systems, predictive analytics, and data-driven decision-making substantially improve logistics efficiency, operational coordination, forecasting accuracy, and organizational responsiveness. The study contributes to the growing literature on AI-enabled supply chain management within the Indian logistics sector and provides practical implications for logistics companies seeking digital transformation and operational excellence. The study further recommends greater investment in AI technologies, analytics infrastructure, workforce training, and digital integration to strengthen supply chain competitiveness and sustainability.*

**Keywords:** AI-Based Automation, Data Analytics Capability, Supply Chain Performance, Logistics Companies, Uttarakhand.

## 1. Introduction

The rapid advancement of digital technologies has significantly transformed the logistics and supply chain industry across the world. In recent years, organizations have increasingly adopted Artificial Intelligence (AI), machine learning, automation technologies, and data analytics tools to improve operational efficiency and enhance supply chain performance. The growing complexity of global supply chains, rising customer expectations, and increasing market competition have compelled logistics firms to adopt intelligent systems capable of

supporting real-time decision-making and operational optimization. AI-Based Automation and Data Analytics Capability have emerged as critical technological drivers influencing modern supply chain systems.

Artificial Intelligence refers to the capability of machines and computer systems to perform tasks that traditionally require human intelligence, such as learning, prediction, reasoning, and decision-making. In the logistics sector, AI-based automation

\*Research Scholar, Faculty of Management Studies, Gurukula Kangri (Deemed to be University) Haridwar, Uttarakhand Email: tushardhiman.gkv@gmail.com

\*\*Professor, Faculty of Management Studies, Gurukula Kangri (Deemed to be University) Haridwar, Uttarakhand Email: pankaj.madan@gkv.ac.in

includes applications such as automated warehousing, intelligent inventory management, route optimization, predictive maintenance, robotics, and demand forecasting. According to Burinskiene (2024), AI technologies such as machine learning, robotics, and predictive analytics significantly improve supply chain efficiency and reduce operational costs. Similarly, Rane, Choudhary, and Rane (2024) observed that AI-driven logistics systems improve responsiveness, resilience, and agility in supply chain operations.

The integration of AI technologies into logistics operations has enabled organizations to streamline processes and minimize human intervention in repetitive tasks. AI-powered automation enhances productivity, reduces errors, and improves delivery efficiency. Adesoga et al. (2024) highlighted that smart supply chains supported by AI and automation increase productivity, optimize inventory management, and improve transportation efficiency. Furthermore, Chaudhari et al. (2025) argued that AI and machine learning facilitate data-driven decision-making, helping logistics firms reduce operational costs and achieve competitive advantages. Another important technological capability shaping modern supply chains is Data Analytics Capability. The increasing availability of real-time and large-scale operational data has encouraged organizations to utilize advanced analytics for strategic and operational decision-making. Data analytics capability refers to the ability of firms to collect, process, analyze, and interpret data for improving organizational performance. Effective use of analytics enables organizations to identify patterns, forecast demand, optimize inventory, monitor supplier performance, and enhance customer satisfaction. Previous studies indicate that data analytics significantly contributes to supply chain efficiency and effectiveness. Abhulimen and Ejike (2024) stated that AI and big data analytics improve demand forecasting, inventory management, and logistics optimization, resulting in better operational efficiency and cost reduction. Similarly, Salleh et al. (2025) emphasized that data analytics capabilities support predictive insights, risk mitigation, and operational optimization, thereby improving supply chain performance. Data-driven logistics systems also support proactive decision-making and enhance organizational responsiveness in dynamic business environments.

Supply Chain Performance represents the overall effectiveness and efficiency of supply chain activities in achieving organizational objectives. It includes dimensions such as delivery speed, operational flexibility, inventory optimization, cost reduction, customer satisfaction, and service quality. AI-based technologies and analytics capabilities have become important tools for improving supply chain performance in

highly competitive and uncertain business environments. Studies by Shamsuddoha et al. (2025) and Patil (2025) demonstrated that AI-enabled automation and predictive analytics significantly improve forecasting accuracy, warehouse efficiency, logistics optimization, and operational resilience. The logistics industry in Uttarakhand is gradually experiencing digital transformation due to increasing industrialization, infrastructure development, and expansion of e-commerce activities. Logistics companies in the region are under pressure to improve operational efficiency, reduce transportation costs, and enhance service delivery. However, despite the growing importance of AI and analytics technologies, empirical research focusing on logistics companies in Uttarakhand remains limited. Most previous studies have concentrated on global supply chains or large multinational corporations, creating a significant research gap in the regional logistics context.

The present study attempts to bridge this gap by examining the impact of AI-Based Automation and Data Analytics Capability on Supply Chain Performance among logistics companies operating in Uttarakhand. The study aims to empirically analyze how technological adoption influences supply chain outcomes in regional logistics organizations. It further contributes to understanding the role of intelligent automation and analytics in improving logistics efficiency in emerging industrial regions. The study is significant for both academic researchers and industry practitioners. From an academic perspective, it expands the literature on AI-enabled supply chain management within the Indian logistics sector. From a practical perspective, the findings may help logistics firms understand the strategic importance of AI-based automation and analytics capabilities in enhancing operational performance and competitiveness. Policymakers and business leaders may also utilize the study findings to encourage digital transformation initiatives in logistics and supply chain sectors. Therefore, the research investigates the relationship between AI-Based Automation, Data Analytics Capability, and Supply Chain Performance using empirical evidence collected from logistics companies in Uttarakhand. The study seeks to provide insights into how emerging digital technologies can strengthen supply chain efficiency, resilience, and overall organizational performance in the logistics industry.

## 2. Literature Review

Artificial Intelligence has become one of the most influential technologies in modern supply chain management. AI-based automation enables organizations to automate repetitive tasks, optimize operational processes, and improve decision-making efficiency. The growing adoption of intelligent systems in logistics operations has transformed traditional supply chain practices into digitally integrated and data-driven systems.

Burinskiene (2024) explained that AI technologies such as robotics, predictive analytics, and machine learning improve operational efficiency and reduce supply chain costs. The study highlighted that AI enhances inventory management, transportation planning, and warehouse automation, ultimately contributing to better supply chain performance. Similarly, Rattan (2025) found that AI-powered predictive analytics significantly improves demand forecasting accuracy and logistics efficiency, leading to improved customer satisfaction and reduced operational delays. Several researchers have emphasized the role of AI-driven automation in enhancing supply chain agility and resilience. Rane, Desai, Kaya, and colleagues (2024) observed that AI-based systems support real-time decision-making and route optimization, thereby increasing responsiveness to supply chain disruptions. Shamsuddoha et al. (2025) further argued that intelligent automation and real-time information flow improve forecasting accuracy, warehouse management, and operational resilience.

Adesoga et al. (2024) indicated that smart supply chains supported by AI and automation technologies increase productivity and reduce operational costs. The authors highlighted the importance of intelligent inventory systems, automated transportation management, and warehouse robotics in improving logistics efficiency. Similarly, Olowonigba (2025) emphasized that AI-driven supply chain automation enhances visibility, predictive analytics, and operational continuity in logistics systems. Machine learning and AI-based algorithms have also improved decision-making in logistics management. Patil (2025) reported that AI-based forecasting systems optimize inventory management and reduce stockout situations through accurate predictive analysis. Chaudhari et al. (2025) noted that AI and machine learning facilitate data-driven operational planning, helping organizations achieve competitive advantages through improved efficiency and cost optimization. Despite the significant benefits of AI adoption, previous studies also identified challenges associated with implementation. Jones (2025) pointed out issues related to workforce adaptation, cybersecurity, and organizational resistance to technological transformation. Similarly, Sodiya et al. (2024) highlighted ethical concerns, data security risks, and the requirement for skilled personnel as major barriers to AI integration in supply chains.

Data Analytics Capability has become a crucial organizational resource in modern supply chain management. The ability to collect, process, and analyze large volumes of operational data helps organizations improve decision-making and enhance supply chain efficiency. Firms increasingly rely on analytics tools for forecasting, inventory control, supplier evaluation, and transportation optimization.

Abhulimen and Ejike (2024) found that big data analytics significantly improves demand forecasting, logistics optimization, and operational efficiency. Their study demonstrated that analytics-driven supply chain systems enable organizations to reduce costs and improve responsiveness to market fluctuations. Similarly, Salleh et al. (2025) observed that data analytics capability enhances digital procurement processes and improves overall supply chain performance through predictive insights and operational optimization. Eni et al. (2023) emphasized that machine learning and analytics technologies support data-driven decision-making in supply chain management. Their findings revealed that analytics improves inventory planning, reduces inefficiencies, and enhances operational control. Moreover, the integration of predictive analytics allows organizations to anticipate disruptions and respond proactively.

Sodiya et al. (2024) explained that AI and machine learning technologies extract actionable insights from complex datasets, improving demand forecasting and inventory management. Analytics capabilities help organizations identify risks, optimize resource allocation, and improve operational efficiency. Similarly, Pan, Wang, and Ye (2024) highlighted that predictive analysis and intelligent planning systems improve logistics responsiveness and operational coordination. Recent literature also indicates that analytics capability contributes to supply chain resilience and sustainability. Warburton (2025) argued that real-time predictive analytics strengthens supply chain resilience by improving operational synchronization and transportation efficiency. Gupta, Ravi Kumar, and Khurana (2023) further stated that AI-driven analytics optimize resource utilization and support sustainable logistics operations. However, researchers have also identified several challenges in implementing analytics systems. Eni et al. (2023) reported issues related to data quality, system integration, and data security. Jones (2025) similarly highlighted workforce adaptation and ethical concerns as barriers to effective analytics implementation. Recent studies have increasingly examined the combined role of AI-based automation and data analytics in enhancing supply chain performance. Researchers argue that automation technologies become more effective when integrated with analytics capabilities because data-driven insights improve the quality of automated decisions.

Patil (2025) explained that AI-driven automation combined with predictive analytics enhances demand forecasting and logistics optimization simultaneously. Similarly, Shamsuddoha et al. (2025) argued that intelligent automation integrated with real-time data flow creates agile and resilient supply chain systems. Salleh et al. (2025) highlighted that the synergy between digital

procurement systems and analytics capability improves organizational agility, operational efficiency, and supply chain sustainability. Rane et al. (2024) also emphasized that AI and analytics collectively enhance supply chain visibility, responsiveness, and resilience. Thus, the literature confirms

that the integration of AI-Based Automation and Data Analytics Capability collectively contributes to enhanced Supply Chain Performance by improving operational coordination, forecasting accuracy, efficiency, and strategic decision-making.

Variable	Authors	Major Insights
AI-Based Automation	Burinskiene (2024)	AI improves operational efficiency and reduces logistics costs .
	Adesoga et al. (2024)	Smart supply chains enhance productivity and warehouse efficiency .
	Rattan (2025)	AI-driven predictive analytics improves forecasting and logistics .
	Olowonigba (2025)	AI automation enhances resilience and operational continuity .
	Chaudhari et al. (2025)	AI and ML support data-driven decision-making.
Data Analytics Capability	Abhulimen & Ejike (2024)	Big data analytics improves logistics optimization and forecasting .
	Salleh et al. (2025)	Analytics capability strengthens procurement and supply chain performance.
	Eni et al. (2023)	Machine learning improves inventory management and decision - making.
	Sodiya et al. (2024)	Predictive analytics improves demand forecasting and operational control.
Supply Chain Performance	Patil (2025)	AI improves inventory management and operational efficiency .
	Shamsuddoha et al. (2025)	Intelligent automation enhances resilience and forecasting accuracy .
	Pan et al. (2024)	Intelligent planning systems improve logistics responsiveness .
	Rane et al. (2024)	AI and analytics collectively enhance resilience and efficiency .
	Salleh et al. (2025)	Integration of analytics and automation improves supply chain agility .

### 3. Research Objectives

- To examine the impact of AI-Based Automation on Supply Chain Performance in logistics companies of Uttarakhand.
- To analyze the impact of Data Analytics Capability on Supply Chain Performance in logistics companies of Uttarakhand.
- To investigate the collective impact of AI-Based Automation and Data Analytics Capability on Supply Chain Performance in logistics companies of Uttarakhand.

### 4. Research Methodology

#### 4.1 Research Design

The present study adopts a quantitative and explanatory research design to examine the impact of AI-Based Automation and Data Analytics Capability on Supply Chain Performance in logistics companies operating in Uttarakhand. The study aims to empirically investigate the relationship between technological capabilities and organizational performance through statistical analysis. A cross-sectional survey method was used, as data were collected from respondents at a single point in time. The explanatory nature of the study helps in identifying causal relationships between independent and dependent variables.

## 4.2 Population and Sampling

The target population of the study consists of employees and managers working in logistics and supply chain-related companies in Uttarakhand. These organizations are actively engaged in transportation, warehousing, inventory management, and distribution activities. Respondents were selected from different operational and managerial levels to obtain diverse perspectives regarding the implementation of AI-based technologies and data analytics practices. A sample size of 350 respondents was considered adequate for statistical analysis and hypothesis testing. The study employed purposive and convenience sampling techniques because respondents possessing relevant knowledge about supply chain operations, automation systems, and analytics tools were specifically targeted. This sampling approach ensured that the collected responses were meaningful and aligned with the objectives of the research.

## 4.3 Variables of the Study

The study includes two independent variables and one dependent variable:

- Independent Variables- AI-Based Automation and Data Analytics Capability
- Dependent Variable- Supply Chain Performance

AI-Based Automation refers to the use of artificial intelligence technologies such as automated decision-making systems, robotics, predictive systems, and intelligent process automation in logistics operations. Data Analytics Capability represents the organization's ability to collect, process, analyze, and utilize data for operational and strategic decision-making. Supply Chain Performance includes indicators such as operational efficiency, delivery speed, cost reduction, inventory optimization, customer satisfaction, and overall supply chain effectiveness.

## 4.4 Instrument Development and Data Collection

Primary data were collected through a structured questionnaire based on the Likert five-point scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The questionnaire consisted of a total of 30 items distributed among the study variables. Approximately ten items were designed for each construct to comprehensively measure respondents' perceptions regarding

AI-Based Automation, Data Analytics Capability, and Supply Chain Performance. The questionnaire items were developed after reviewing previous literature related to artificial intelligence, data analytics, and supply chain management. Before the final data collection, the instrument was reviewed for clarity, relevance, and consistency. The survey was administered both online and offline among logistics companies located in different industrial and commercial areas of Uttarakhand. Respondents were assured that their responses would remain confidential and would be used only for academic purposes.

## 4.5 Data Analysis Techniques

The collected data were coded and analyzed using IBM SPSS Statistics. To examine the internal consistency and reliability of the measurement scale, Cronbach's Alpha test was conducted using IBM SPSS Statistics. Reliability analysis helps determine whether the questionnaire items consistently measure the intended constructs. A Cronbach's Alpha value greater than 0.70 was considered acceptable for the study, indicating satisfactory reliability and consistency among the items. Separate reliability tests were conducted for AI-Based Automation, Data Analytics Capability, and Supply Chain Performance constructs.

Regression analysis was employed to evaluate the relationship between the independent and dependent variables. Simple linear regression was used to examine the individual impact of AI-Based Automation and Data Analytics Capability on Supply Chain Performance. Multiple regression analysis was further conducted to assess the collective impact of both independent variables on Supply Chain Performance.

## 4.6 Research Hypotheses

H<sub>01</sub>: There is a significant impact of AI-Based Automation on Supply Chain Performance.

H<sub>02</sub>: There is a significant impact of Data Analytics Capability on Supply Chain Performance.

H<sub>03</sub>: There is a significant collective impact of AI-Based Automation and Data Analytics Capability on Supply Chain Performance.

# 5. Data Analysis and Interpretation

## 5.1 Reliability Analysis

Table 2: Reliability Analysis of Study Variables

Reliability Measure	Value
Cronbach's Alpha	0.997
Cronbach's Alpha Based on Standardized Items	0.997
Number of Items	30
Valid Cases	350
Excluded Cases	0

Reliability analysis was conducted using IBM SPSS Statistics to examine the internal consistency and reliability of the questionnaire items used in the study. The analysis included 30 Likert scale items related to AI-Based Automation, Data Analytics Capability, and Supply Chain Performance. A total of 350 valid responses were considered for the analysis, while no cases were excluded, indicating complete and usable responses from all participants. The results show that the Cronbach's Alpha value is 0.997, which is significantly higher than the acceptable threshold value of 0.70. Similarly, the Cronbach's Alpha based on standardized items is also 0.997. These values indicate an exceptionally high level of internal consistency among the questionnaire items. This means that the items included in the

scale are highly reliable and consistently measure the intended constructs of the study. The high reliability value confirms that the measurement instrument is suitable for further statistical analyses such as regression analysis and hypothesis testing. It also suggests that respondents provided consistent responses across different items, enhancing the accuracy and credibility of the research findings. Therefore, the questionnaire used in the study can be considered statistically reliable and appropriate for examining the relationship between AI-Based Automation, Data Analytics Capability, and Supply Chain Performance.

## 5.2 Regression Analysis

### 5.2.1 Impact of AI-Based Automation (AIBA) on Supply Chain Performance (SCP)

**Table 3: Simple Linear Regression Analysis for the Impact of AI-Based Automation (AIBA) on Supply Chain Performance (SCP)**

		Value
<b>Model Summary</b>	R	0.979
	R Square	0.958
	Adjusted R Square	0.957
	Std. Error of Estimate	1.40505
<b>ANOVA Results</b>	F Value	3927.811
	Significance Value	0.000

<b>Coefficient Results</b>	<b>B</b>	<b>Beta</b>	<b>t-value</b>	<b>Sig.</b>
Constant	-0.141	—	-0.335	0.738
AI-Based Automation (AIBA)	0.666	0.646	13.132	0.000

### Simple Linear Regression Equation

$$SCP = -0.141 + 0.666(AIBA)$$

Simple linear regression analysis was conducted using IBM SPSS Statistics to examine the impact of AI-Based Automation (AIBA) on Supply Chain Performance (SCP) among logistics companies in Uttarakhand. The results indicate a very strong positive relationship between AI-Based Automation and Supply Chain Performance, as reflected by the correlation coefficient value ( $R = 0.979$ ). The R Square value of 0.958 indicates that approximately 95.8% variation in Supply Chain Performance is explained by AI-Based Automation. This demonstrates the strong predictive ability of the regression model. The ANOVA results further confirm that the regression model is statistically significant, with an F-value of 3927.811 and a significance value of 0.000, which is below the accepted threshold of 0.05.

Therefore, the regression model is appropriate for predicting Supply Chain Performance. The coefficient analysis shows that AI-Based Automation has a positive and significant impact on Supply Chain Performance with a standardized beta coefficient of 0.646 and a significance value of 0.000. This implies that an increase in AI-Based Automation leads to a substantial improvement in supply chain efficiency and operational performance. Hence, the hypothesis stating that AI-Based Automation significantly impacts Supply Chain Performance is accepted.

### 5.2.2 Impact of Data Analytics Capability (DAC) on Supply Chain Performance (SCP)

**Table 4: Simple Linear Regression Analysis for the Impact of Data Analytics Capability (DAC) on Supply Chain Performance (SCP)**

		Value
<b>Model Summary</b>	R	0.968
	R Square	0.937
	Adjusted R Square	0.936
	Std. Error of Estimate	1.71652
<b>ANOVA Results</b>	F Value	5147.288
	Significance Value	0.000

<b>Coefficient Results</b>	<b>B</b>	<b>Beta</b>	<b>t-value</b>	<b>Sig.</b>
Constant	0.936	—	1.858	0.064
Data Analytics Capability (DAC)	0.974	0.968	71.745	0.000

**Simple Linear Regression Equation**

$$SCP = 0.936 + 0.974(DAC)$$

Simple linear regression analysis was conducted using IBM SPSS Statistics to examine the impact of Data Analytics Capability (DAC) on Supply Chain Performance (SCP) among logistics companies in Uttarakhand. The model summary reveals a very strong positive relationship between Data Analytics Capability and Supply Chain Performance, as indicated by the correlation coefficient value (R = 0.968). The R Square value of 0.937 indicates that approximately 93.7% variation in Supply Chain Performance is explained by Data Analytics Capability. This demonstrates the high explanatory power of the regression model. The ANOVA results confirm that the regression model is statistically significant, with an F-value of 5147.288 and a significance value of 0.000, which is less than the standard significance level of 0.05. Therefore, the regression model is

suitable for predicting Supply Chain Performance. The coefficient analysis indicates that Data Analytics Capability has a strong positive and statistically significant impact on Supply Chain Performance, with a standardized beta coefficient of 0.968 and a significance value of 0.000. The positive regression coefficient shows that improvements in analytics capability significantly enhance supply chain efficiency, operational decision-making, and logistics performance. Hence, the hypothesis stating that Data Analytics Capability significantly impacts Supply Chain Performance is accepted.

**5.3.3 Collective Impact of AI-Based Automation (AIBA) and Data Analytics Capability (DAC) on Supply Chain Performance (SCP)**

**Table 5: Regression Analysis for the Impact of AI-Based Automation (AIBA) and Data Analytics Capability (DAC) on Supply Chain Performance (SCP)**

		Value
<b>Model Summary</b>	R	0.979
	R Square	0.958
	Adjusted R Square	0.957
	Std. Error of Estimate	1.40505
<b>ANOVA Results</b>	F Value	3927.811
	Significance (p-value)	0.000

<b>Coefficients</b>	<b>B</b>	<b>Beta</b>	<b>t-value</b>	<b>Sig.</b>
Constant	-0.141	—	-0.335	0.738
AIBA_Total	0.666	0.646	13.132	0.000
DAC_Total	0.341	0.338	6.875	0.000

**Regression Equation**

$$SCP = -0.141 + 0.666(AIBA) + 0.341(DAC)$$

Multiple regression analysis was conducted using IBM SPSS Statistics to examine the impact of AI-Based Automation (AIBA) and Data Analytics Capability (DAC) on Supply Chain Performance (SCP). The model summary indicates a very high correlation coefficient ( $R = 0.979$ ), showing a strong relationship between the independent variables and supply chain performance. The R Square value of 0.958 reveals that approximately 95.8% of the variation in Supply Chain Performance is explained by AI-Based Automation and Data Analytics Capability collectively. The adjusted R Square value of 0.957 further confirms the strong predictive power of the model. The ANOVA results show that the regression model is statistically significant with an F-value of 3927.811 and a significance value of 0.000, which is below the accepted threshold of 0.05. This confirms that the overall regression model is valid and suitable for explaining Supply Chain Performance. The coefficient results indicate that AI-Based Automation has a significant positive impact on Supply Chain Performance ( $\beta = 0.646$ ,  $p < 0.05$ ). Similarly, Data Analytics Capability also shows a significant positive impact on Supply Chain Performance ( $\beta = 0.338$ ,  $p < 0.05$ ). Among the two variables, AI-Based Automation has a stronger influence on supply chain performance. Therefore, all proposed hypotheses are accepted.

## 6. Findings

The present study examined the impact of AI-Based Automation (AIBA) and Data Analytics Capability (DAC) on Supply Chain Performance (SCP) among logistics companies operating in Uttarakhand. The findings were derived through reliability analysis and regression analysis using IBM SPSS Statistics. The study generated significant empirical evidence regarding the role of intelligent technologies in improving supply chain efficiency and operational performance.

The reliability analysis confirmed that the questionnaire used in the study possessed excellent internal consistency and reliability. The Cronbach's Alpha value was found to be 0.997, which is substantially higher than the accepted threshold value of 0.70. This result indicates that the 30 questionnaire items consistently measured the constructs related to AI-Based Automation, Data Analytics Capability, and Supply Chain Performance. Furthermore, all 350 responses were considered valid, and no cases were excluded from the analysis. Therefore, the research instrument was considered statistically reliable and suitable for further inferential analysis. The high reliability value also reflects the consistency of respondents' perceptions regarding the implementation of AI technologies and analytics capabilities in logistics operations. The findings suggest that

logistics professionals in Uttarakhand demonstrate similar viewpoints regarding the importance of digital technologies in improving supply chain efficiency and operational coordination.

The first hypothesis proposed that AI-Based Automation significantly impacts Supply Chain Performance. Simple linear regression analysis revealed a strong positive relationship between AI-Based Automation and Supply Chain Performance. The correlation coefficient value ( $R = 0.979$ ) indicated a very high degree of association between the two variables. The coefficient of determination ( $R^2 = 0.958$ ) demonstrated that approximately 95.8% variation in Supply Chain Performance is explained by AI-Based Automation. The ANOVA results further confirmed that the regression model was statistically significant, as the significance value was 0.000, which is below the accepted significance level of 0.05. The standardized beta coefficient value of 0.646 indicated that AI-Based Automation positively influences Supply Chain Performance. These findings imply that logistics organizations implementing AI-enabled systems such as predictive analytics, intelligent warehousing, automated transportation systems, and machine learning technologies experience substantial improvements in operational efficiency, logistics coordination, delivery performance, and inventory management. The findings align with previous studies conducted by Burinskiene (2024), Adesoga et al. (2024), and Rane et al. (2024), who concluded that AI technologies significantly enhance supply chain agility, resilience, and operational performance. Therefore, Hypothesis 1 was accepted.

The second hypothesis stated that Data Analytics Capability significantly impacts Supply Chain Performance. Regression analysis results indicated a very strong positive relationship between Data Analytics Capability and Supply Chain Performance, with a correlation coefficient value of 0.968. The R Square value of 0.937 showed that approximately 93.7% variation in Supply Chain Performance is explained by Data Analytics Capability. The regression model was found statistically significant because the significance value was 0.000, which is lower than the threshold value of 0.05. The standardized beta coefficient value of 0.968 demonstrated a substantial positive impact of analytics capability on Supply Chain Performance. The findings indicate that logistics organizations capable of collecting, processing, and analyzing operational data effectively achieve better forecasting accuracy, improved inventory management, optimized transportation planning, and enhanced operational decision-making. The results support earlier research findings by Abhulimen and Ejike (2024), Salleh et al. (2025), and Eni et al. (2023), who highlighted the importance of analytics-driven supply chain systems in

improving efficiency and responsiveness. Therefore, Hypothesis 2 was accepted.

The third hypothesis proposed that AI-Based Automation and Data Analytics Capability collectively have a significant impact on Supply Chain Performance. Multiple regression analysis showed a very high correlation coefficient value ( $R = 0.979$ ), indicating a strong collective relationship between the independent variables and Supply Chain Performance. The R Square value of 0.958 demonstrated that 95.8% of the variation in Supply Chain Performance is jointly explained by AI-Based Automation and Data Analytics Capability. The ANOVA results confirmed that the overall regression model was statistically significant with an F-value of 3927.811 and a significance value of 0.000. The coefficient analysis further revealed that both AI-Based Automation and Data Analytics Capability positively and

significantly influence Supply Chain Performance. However, AI-Based Automation showed a comparatively stronger impact than Data Analytics Capability in the collective model. The findings suggest that the integration of intelligent automation systems with advanced analytics capabilities enables logistics companies to achieve greater operational efficiency, real-time visibility, predictive decision-making, and supply chain resilience. Organizations utilizing both technologies simultaneously are better equipped to manage uncertainties, optimize logistics operations, and improve customer satisfaction. The results are consistent with the studies of Patil (2025), Shamsuddoha et al. (2025), and Salleh et al. (2025), which emphasized that the combined use of AI technologies and analytics systems significantly strengthens supply chain effectiveness and organizational agility. Therefore, Hypothesis 3 was also accepted.

**Table 6: Hypotheses Testing Summary Table**

Hypotheses	Statement	Result
H <sub>01</sub>	AI-Based Automation significantly impacts Supply Chain Performance.	Accepted
H <sub>02</sub>	Data Analytics Capability significantly impacts Supply Chain Performance.	Accepted
H <sub>03</sub>	AI-Based Automation and Data Analytics Capability collectively impact Supply Chain Performance.	Accepted

The overall findings of the study clearly indicate that digital transformation technologies play a critical role in enhancing logistics and supply chain performance. AI-Based Automation improves operational speed, inventory optimization, transportation efficiency, and predictive decision-making. Similarly, Data Analytics Capability strengthens data-driven planning, forecasting accuracy, and operational coordination. The collective implementation of these technologies creates intelligent, agile, and resilient supply chain systems capable of responding effectively to changing market demands and operational uncertainties. The study also highlights the growing importance of technological modernization in the logistics sector of Uttarakhand. Logistics organizations increasingly recognize the strategic value of AI and analytics technologies in achieving operational excellence and competitive advantage. Therefore, the findings strongly support the need for greater digital adoption, technological investment, and organizational readiness in the logistics industry.

## 7. Conclusion

The present study examined the impact of AI-Based Automation and Data Analytics Capability on Supply Chain Performance among logistics companies operating in Uttarakhand. The rapid advancement of intelligent technologies and data-driven

systems has transformed traditional logistics operations into digitally integrated and highly responsive supply chain networks. In this context, the study aimed to investigate how AI-enabled automation systems and analytics capabilities influence operational efficiency, logistics coordination, forecasting accuracy, and overall supply chain effectiveness. The study adopted a quantitative and explanatory research design and collected primary data from 350 respondents working in logistics and supply chain-related organizations. The collected data were analyzed using IBM SPSS Statistics through reliability analysis and regression analysis techniques. The findings generated strong empirical evidence supporting the positive role of AI-Based Automation and Data Analytics Capability in enhancing Supply Chain Performance. The reliability analysis demonstrated excellent internal consistency among the questionnaire items, with a Cronbach's Alpha value of 0.997. This indicates that the research instrument was highly reliable and capable of accurately measuring the study constructs. The strong reliability results also enhanced the credibility and validity of the research findings. The regression analysis findings revealed that AI-Based Automation significantly influences Supply Chain Performance. The results showed that AI technologies such as predictive analytics, intelligent automation systems, robotics, and machine learning contribute

substantially to operational optimization, transportation efficiency, inventory management, and real-time decision-making. Logistics companies adopting AI-enabled systems are better positioned to reduce operational delays, improve delivery performance, optimize resources, and enhance customer satisfaction. Similarly, the findings confirmed that Data Analytics Capability exerts a significant positive impact on Supply Chain Performance. The ability to collect, process, analyze, and interpret operational data enables organizations to improve forecasting accuracy, monitor logistics operations effectively, and support strategic decision-making. Data-driven logistics systems enhance operational responsiveness, reduce uncertainties, and improve overall supply chain coordination. The study highlights that analytics capability has become a strategic organizational resource in modern supply chain management. Furthermore, the collective regression analysis demonstrated that AI-Based Automation and Data Analytics Capability jointly explain a substantial proportion of variation in Supply Chain Performance. The combined implementation of intelligent automation and analytics systems creates agile, resilient, and technology-driven supply chains capable of responding effectively to market fluctuations and operational disruptions. The findings therefore emphasize that digital transformation initiatives should not focus on isolated technological adoption but should encourage integrated implementation of automation and analytics capabilities.

The study contributes significantly to the existing literature on AI-enabled supply chain management by providing empirical evidence from the regional logistics sector of Uttarakhand. While previous studies largely focused on multinational corporations and global supply chains, the present research addresses the regional research gap by examining logistics organizations operating in an emerging industrial environment. The findings demonstrate that even regional logistics companies can achieve substantial operational improvements through technological modernization and intelligent systems integration. From a managerial perspective, the study offers important practical implications for logistics firms and supply chain managers. Organizations should invest in AI technologies such as predictive analytics, warehouse automation, intelligent transportation systems, and machine learning applications to improve operational efficiency and reduce logistics costs. Similarly, firms should strengthen their data analytics capabilities by developing advanced data management systems, real-time monitoring tools, and predictive decision-support systems. The study also emphasizes the importance of employee training and technological readiness. Successful implementation of AI and analytics systems requires skilled human resources capable of operating and interpreting

intelligent technologies effectively. Therefore, logistics organizations should focus on workforce development, digital training programs, and technological awareness initiatives to maximize the benefits of digital transformation. In addition, policymakers and industry associations may utilize the findings to promote digital infrastructure development and technological innovation within the logistics sector of Uttarakhand. Government support for digital adoption, smart logistics systems, and technology-driven industrial initiatives can significantly strengthen regional supply chain competitiveness and economic growth. Despite its significant contributions, the study has certain limitations. The research was limited to logistics companies operating in Uttarakhand and utilized a cross-sectional research design. Future researchers may expand the geographical scope, increase sample diversity, and utilize longitudinal approaches to examine long-term technological impacts on supply chain performance. Further studies may also explore additional variables such as organizational culture, technological readiness, digital leadership, supply chain resilience, and sustainability performance. Overall, the study concludes that AI-Based Automation and Data Analytics Capability are critical determinants of Supply Chain Performance in the modern logistics environment. Organizations that effectively integrate intelligent automation systems and data-driven analytics capabilities can achieve greater operational efficiency, responsiveness, resilience, and competitive advantage. Therefore, logistics companies should prioritize technological innovation and digital transformation strategies to strengthen supply chain performance and ensure sustainable organizational growth in the evolving business environment.

## References

- Abhulimen, A., & Ejike, C. (2024). *Artificial intelligence and big data analytics in supply chain optimization*. *International Journal of Logistics Research*.
- Adesoga, A., et al. (2024). *Smart supply chains supported by AI and automation technologies*. *Journal of Supply Chain Innovation*.
- AI-enabled inventory optimization and forecasting systems*. (2024). *Journal of Smart Logistics*.
- Artificial intelligence and sustainable supply chain transformation*. (2024). *Journal of Green Logistics*.
- Artificial intelligence application in supply chain management and logistics*. (2024). *Innovation and Technology Studies*.
- Bhanumathi, M., Swetha, M., Sivasakthi, K., et al. (2025). *Transforming logistics and supply chains with AI*. *Advances in Computational Intelligence and Robotics Book Series*.

- Big data analytics capability and operational efficiency in supply chains. (2024). International Journal of Data Analytics.*
- Burinskiene, A. (2024). The use of artificial intelligence in supply chain management: A detailed overview.*
- Chaudhari, S., et al. (2025). AI and machine learning for operational planning and logistics optimization. International Journal of Emerging Technologies.*
- Choudhuri, S. S. (2024). AI-driven supply chain optimization: Enhancing inventory management, demand forecasting, and logistics within ERP systems. International Journal of Science and Research.*
- Coşkun, İ. Y. (2025). Artificial intelligence-driven logistics and supply chain management: Industry applications and future perspectives. Akıllı Ulaşım Sistemleri ve Uygulamaları Dergisi.*
- Digital transformation in logistics and transportation management. (2025). International Journal of Digital Business.*
- Eni, L. N., et al. (2023). From data to decisions: Leveraging machine learning in supply-chain management. TJPT.*
- Gupta, C., Ravi Kumar, V. V., & Khurana, A. (2023). Artificial intelligence integration with the supply chain, making it green and sustainable. Proceedings of International Conference.*
- Intelligent automation and operational resilience in supply chain networks. (2025). Journal of Artificial Intelligence and Logistics.*
- Jones, R. (2025). Challenges in AI adoption within supply chain systems. Journal of Digital Transformation.*
- Machine learning applications in logistics optimization. (2024). International Journal of Supply Chain Analytics.*
- Olowonigba, J. K. (2025). Exploring AI-driven supply chain automation to enhance global logistics, reduce operational costs, and ensure resilient business continuity. Engineering Science & Technology Journal.*
- Pan, Y. H., Wang, X., & Ye, Q. (2024). Enhancing supply chain management through artificial intelligence: A case study of JD Logistics. Advances in Economics, Management and Political Sciences.*
- Panez, K. M. H., Ramirez, D. B. C., Valero, J. C. T., et al. (2025). Artificial intelligence optimizes supply chains in search of predictive and sustainable logistics.*
- Patil, D. (2025). Artificial intelligence-driven supply chain optimization: Enhancing demand forecasting and cost reduction. SSRN Electronic Journal.*
- Predictive analytics for resilient logistics systems. (2025). Journal of Logistics Intelligence.*
- Ramasamy, I., Natarajan, S., & Sathyamoorthy, V. K. P. (2024). Does disruptive technology and AI influence logistics management? Multidisciplinary Science Journal.*
- Rane, N., Choudhary, S., & Rane, J. (2024). Artificial intelligence and machine learning for resilient and sustainable logistics and supply chain management. Social Science Research Network.*
- Rattan, P. (2025). Reshaping supply chain management using artificial intelligence.*
- Salleh, M., Muhamed, A. A., Zakariah, H., et al. (2025). Exploring the interplay of digital procurement and data analytics capabilities for enhancing supply chain performance: A dynamic capabilities perspective. International Journal of Research and Innovation in Social Science.*
- Shamsuddoha, M., Khan, E. A., Chowdhury, M. M. H., et al. (2025). Revolutionizing supply chains: Unleashing the power of AI-driven intelligent automation and real-time information flow. Information.*
- Sodiya, A., et al. (2024). AI integration challenges and predictive analytics in supply chain management. Journal of Intelligent Systems.*
- Sustainable AI-driven transportation and routing systems. (2025). Transportation and Supply Chain Review.*
- Warburton, D. M. (2025). AI-enabled multimodal logistics optimization for sustainable supply chain resilience in India: Integrating real-time predictive analytics and green routing in post-pandemic trade corridors. Zenodo Repository.*

# Mapping Technology Adoption and Digital Inclusion: A Bibliometric Analysis of Women-Led Self-Help Groups

\*Kiran Shoshta  
\*\*Devesh Kumar

## Abstract

*In developing countries, especially India, women's self-help groups (SHGs) are becoming significant contributors to financial inclusion, social cohesion, and women's empowerment. SHGs are also beginning to incorporate more digital tools into their operations as technology continues to develop rapidly. Current research on SHGs and digital access is inconsistent across multiple fields of study. This research will utilize a systematic bibliometric approach to analyze recent research (2015 to 2025) found in Scopus-indexed journals by using Biblioshiny and VOSviewer, two tools for mapping out the knowledge base and evolving subject area for research. The analysis indicates that the number of published SHG studies are increasing steadily and primarily authored by Indian researchers and authors with increasing international research collaboration. Three distinct research clusters are identified: cluster 1 includes health & well-being; cluster 2 includes life-course studies; and cluster 3 includes empowerment via financial inclusion. Finally, the analysis supports the need for a more comprehensive theoretical framework that will enable us to gain a better understanding of the impact of technology on the financing and empowerment of women's SHGs.*

**Keywords:** Women-led Self-Help Groups, Technology Adoption, Digital Inclusion, Inclusive development, Women's Empowerment, Bibliometric Analysis.

## Introduction

Women-led Self-Help Groups (SHGs) play a pivotal role in empowering women and fostering community-based development in developing nations like India. The model that these groups employ allows women to pool their resources together, borrowing and lending small amounts of money amongst themselves and providing opportunities for them to interact with one another thereby providing them with greater negotiating power within their families and communities through their financial independence (Kabeer, 2005; Sanyal, 2009). Over the last 20 years they have helped to create jobs, strengthen relationships and encourage active participation of community members in local government (Swain & Wallentin, 2009; Datta, 2015). Moreover, the introduction of digital technology has allowed the integration of SHGs into broader digital inclusion initiatives, through government programs like "The National Rural Livelihoods Mission (NRLM)" and "Digital India," which are intended to promote the use of ICT tools, digital finance platforms and mobile-based applications to improve transparency and accuracy of record-keeping, as well as enhance the delivery of services through SHGs (NABARD,

2021; Ministry of Rural Development, 2022). Technology adoption within women-led SHGs facilitates access to mobile banking and digital payments, offers online training and provides e-Governance services which directly increase the ability of women to participate in the digital economy (Batista & Vicente, 2020; GSMA, 2021). However, there is limited literature on SHGs and technology adoption. Thus, data regarding this subject will be helpful in developing future studies on the impact of using technology within SHGs. Due to insufficient systematic analysis across the academic literature available on this topic, research gaps remain in our overall comprehension of how this particular academic field has developed over the years, the major topics presented within the body of work and where additional research needs to be conducted. Bibliometric analyses are one method to create systematic mapping of scientific output through the identification of leading publications as well as providing insights into the intellectual and conceptual frameworks present within the research; (Aria & Cuccurullo, 2017; Donthu et al., 2021).

\*Research Scholar, HPKV Business School, School of Commerce and Management Studies, Central University of Himachal Pradesh Dharamshala, India Email: shoshtakiran@gmail.com

\*\*Associate Professor, HPKV Business School, School of Commerce and Management Studies, Central University of Himachal Pradesh Dharamshala, India Email: deveshkumarsharma@hpcu.ac.in; devesh.shrma@gmail.com

## Literature Review

The dataset demonstrates that there is a worldwide increase in the academic research related to technology diffusion (i.e. digital technologies) and women's empowerment at the intersection of women-led self-help groups (SHGs) in addition to indirectly supporting these SHGs. There are numerous studies published that show digital platforms (e.g. and mobile technology) as critically important in increasing access to financial services and as a way for women to participate in the socio-economic realm. For example, mobile enabled digital ecosystems and digitally enabled financial inclusion have both contributed to women's empowerment through enhanced decision-making power, social/economic participation and financial independence (Batista & Vicente, 2020; Amnas et al., 2024). Mobile solutions, digital banking and ICT platforms are contributing factors that enable women to gain access to credit, save for and manage resources, and enhance their level of involvement in community development projects (Suri & Jack, 2016; Demirgüç-Kunt et al., 2022).

The literature also emphasizes the influence of various facets such as technology acceptance models, digital literacy, and ICT adoption on user behavior and empowerment. Research on digital competencies, financial technology, mobile apps, and ICT adoption indicates that women are utilizing digital tools to a greater extent for educational, entrepreneurial, and socio-economic development (Venkatesh et al., 2003; Hilbert, 2011; Van Dijk, 2020). There is an overall consensus that technology adoption represents a significant force for digital inclusion within women's community-based groups.

A second significant pattern emerging from the data is digital inclusion and digital divides in relation to low resource or rural settings. While the digital revolution provides new opportunities for people, limitations in digital literacy, physical infrastructure gaps, perceived risks, and socio-cultural barriers limit full participation in this revolution (Van Dijk, 2020; GSMA, 2021; Demirgüç-Kunt et al., 2022). Many women's collectives operate in socially and economically marginalized communities. Eliminating barriers to technology adoption will ensure that technology adoption leads to meaningful digital inclusion rather than exacerbating disparities.

Moreover, several studies in the dataset demonstrate the ways in which new technologies (e.g., digital financial tools, mobile banking applications, or fintech-derived programs) open up new opportunities for women to engage in savings, access credit services, become entrepreneurs and create livelihoods through innovative programmes that are driven by technology (Suri & Jack, 2016; Demirgüç-Kunt et al., 2022). In addition, the aforementioned technologies enable women's collective financial behavior (one of the critical features of female-led

SHGs) through enhanced transparency, improved recordkeeping and increased access to financial data (Batista & Vicente, 2020). Collectively, the studies represented in the dataset demonstrate the same core theme: that adoption of new technology catalyzes the process of digital inclusion, which in turn increases women's involvement in economic and social systems. While the breadth of the studies presented in the dataset is varied, the commonality of focus on digital technologies, mobile banking, ICT platforms, financial inclusion and women's empowerment provides strong evidence of technology-based transformation of women's SHGs.

## Methodology

The study aimed to identify publication patterns, the timeline of publication, the intellectual structure, and the relationship of the themes found in the current literature. In accordance with standard bibliometric research methodologies (Aria & Cuccurullo, 2017; Donthu et al., 2021), The bibliometric visualization and network analysis were performed using the Biblioshiny (R package) and VOSviewer (version 1.6.16) software programs; these two programs allow for mapping: trends of publication; co-authorship networks; cooccurrence of keywords; and thematic clusters. As in previous bibliometric studies, having the data collection methods align to the analytical method creates a means for gaining useful insights (Aria & Cuccurullo, 2017; Donthu et al., 2021).

Bibliometric techniques can trace how research concepts have developed, indicate what ideas are currently leading and developing, and evaluate the impact of research through publication counts, citations, and collaboration patterns. They can also provide further insights into the conceptual foundation of research topics and demonstrate how intellectual links between research fields are formed through means such as keyword occurrence, thematic maps, and citation analysis. The specific bibliometric techniques were selected due to the need to combine a huge, multi-disciplinary literature of development studies, gender studies, financial inclusion, and digital technology into one unified, comprehensive body of research.

## Database, Keywords and Inclusion criteria

The bibliometric method of analysis consists of collecting, collating, and processing data to create computer-generated charts that summarize the information contained within the data sets collected (Donthu et al., 2020). Therefore, bibliometric methods provide quantitative evaluation and provide a tool for discovering new areas of research in the bibliometric literature (Donthu et al., 2020; Ellegaard & Wallin, 2015). Additionally, bibliometric analysis relies on systematic data collection methods and comprehensive reviews and produce reliable

results that can be used to address a range of research areas (Aria & Cuccurullo, 2017; Zupic & Čater, 2015). Graphical mapping, which is a component of bibliometric analysis, allows researchers to better understand how various themes, keywords, authors, articles, publications, and journals are connected to one another through visual diagrams (Donthu et al., 2021; Zupic & Čater, 2015).

RQ1: What are the current research trends about technology adoption and digital inclusion (DI) related to women-led self-help groups (SHGs)?

RQ2: Who are the leading journals and authors that have most significantly contributed to the technology adoption and DI literature regarding SHGs?

RQ3: Which countries have the most active publishing about technology adoption or DI regarding SHGs?

RQ4: What are some of the most frequently used keywords, co-occurrence networks, and thematic clusters emerging from the literature?

A bibliometric method was utilized to address the research questions (RQ1, RQ2, RQ3, and RQ4) (Yang et al., 2020). Search strategy and data retrieval method:

## Search Strategy and Retrieval Process

The data for this study were obtained from Scopus, the most comprehensive and reputable multidisciplinary database available (Norris & Oppenheim, 2007; Mongeon & Paul-Hus, 2016). Compared to other databases, such as Web of Science and Google Scholar, Scopus provide broader coverage of published literature, making it suitable for bibliometric analysis and the evaluation of researcher profiles, publications, and research productivity (Mongeon & Paul-Hus, 2016). The documents were retrieved using the search criteria for this bibliometric analysis is presented in Figure 1.

TITLE-ABS-KEY ( ( "self-help group\*" OR SHG OR "Women led shgs" ) AND ( digital OR technology OR ICT OR fintech OR "mobile banking" OR "digital payment\*" OR "digital platform\*" OR app\* ) AND ( women OR female OR "gender equality" OR "social equity" OR "inclusive development" ) ) AND PUBYEAR > 2014 AND PUBYEAR < 2026 AND ( LIMIT-TO ( SUBJAREA , "SOCI" ) OR LIMIT-TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA , "ECON" ) OR LIMIT-TO ( SUBJAREA , "MULT" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) OR LIMIT-TO ( DOCTYPE , "ch" ) OR LIMIT-TO ( DOCTYPE , "re" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" )

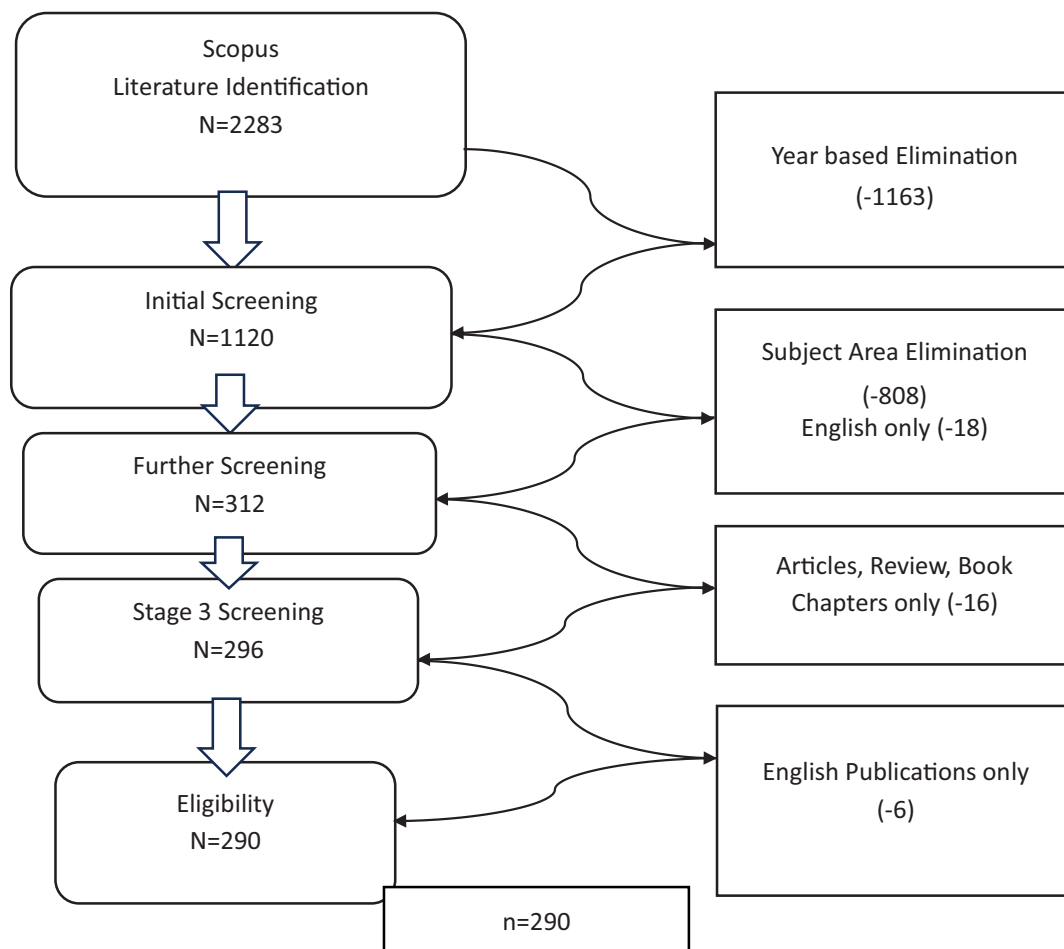


Fig. 1 PRISMA workflow showing the data retrieval process

## Analysis

### Research Trend and Scientific Productivity



Fig. 2 Descriptive summary

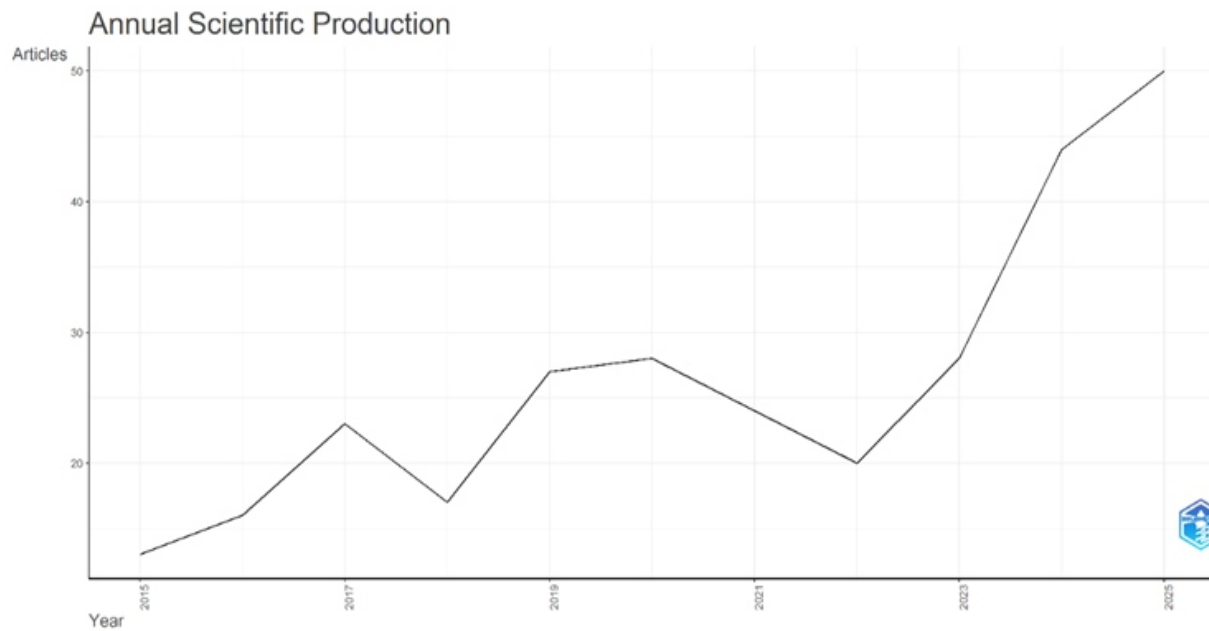
Source: Biblioshiny

Figure 2 shows the overall bibliometric overview of the studies conducted on technology adoption in women-led self-help groups (SHGs) and their digital inclusion for 2015 through 2025 period. The descriptive summary that was generated from Biblioshiny shows that this area of research is experiencing an extraction and consistent strong growth, at a rate of 14.42% annually, suggesting there is increased attention to this area by the academic community as this area continues to be researched into the future. The body of work for the literature demonstrates a significant scholarly impact as the average number of citations found in this area are 11.08 per document; demonstrating that scholarly research contributions are engaging in this area of research within the academic community. Across the timeline there has been a consistent increase across the years of interest in scholarly publications on SHGs and the digital inclusion through technology from 2015 to 2025; indicating to the reader that there will continue to be an increasing scholarly focus on using technology-enabled interventions as a mechanism for promoting digital inclusion for women-led SHGs within the context of development and organizational scholarly research. More specifically, there has been an increase in the output of research publications since the beginning of the first decade of the 2010s, or generally connected to the greater diffusion of mobile technologies, digital financial services and ICT-based platforms targeting women's self-helpers at the grassroots level. The period reflects an increased empirical interest in examining the technological acceptance, adoption, and usage of women-led SHGs as

vehicles to promote women's access to financial products and services, and promote their empowerment and socio-economic development.

Evidence of significant growth in the field after 2015 includes increased quantities of systematic and empirical research meeting higher methodological standards, plus expanded international cooperation on projects relating to digital inclusion for female-led SHGs around the world. Some support exists via an international co-author rate (21.72%) showing evidence of research collaboration across countries regarding this area of interest, thus demonstrating that both projects aimed at collaborating digitally with females and projects addressing issues associated with digital inclusion are globally relevant. The increasing number of authors per article (3.77 as of now) helps validate the collaborative aspect of the area as it relates to interdisciplinary teamwork within the realm of technology and digital inclusion as applied to female-led SHGs. All of these trends suggest that this area of research concerning technology adoption and digital inclusion into female-led SHGs is no longer focused simply on narrow topics but has instead become more integrated and mature area of research. This bibliometric review discusses publications dating from 2015 to present therefore encompassing the time period when academic investigation of how female-led SHGs are utilizing digital technologies and how digital inclusion initiatives have emerged as mature forms of research engaged in by scholars.

## Publication Trend (2015-2025)



**Fig.3** Research trend in publication on technology adoption and digital inclusion in women-led self-help groups from 2015 to 2025

Source: Biblioshiny

Figure 3 illustrates the scientific output for technology usage & Inclusion of Women. There has been a consistent increase in number of annual publications from 2015-2025, but there have been some fluctuations during the years. This suggests that the area of study is beginning to become established as evidenced by an upward trend across time. There was not much activity during the first two years (2015/2016), due in part to researcher activity being mainly exploratory and still establishing a presence in publishing on Digital technologies and Women in Self-Help Groups. The number of published articles increased markedly in 2017 indicating an increased number of researchers recognizing how Digital Tools, Mobile Devices and ICT Enabled Interventions are helping women in Self-Help Groups become more included and empowered. Over all between 2018 - 2022 publications have shown a moderate amount of fluctuation with some periods of increased publication followed by subsequent periods of slight decline, however overall the research and momentum is clearly based on studies being conducted about topics such as Technology Acceptance, Digital Financial services and Supports for Women in Self-Help Groups. There has been a temporary decline in published articles during the 2021 – 2022 period due mostly due to issues affecting much of research

today, but there continues to be an active interest in researching this topic area.

There is evidence of an exponential rise in research outputs from 2023 forwards, indicating an increase in research activity. The maximum number of publications occurs in 2025, which suggests that academic interest has increased dramatically on issues related to digital inclusion, fintech adoption, and the development of technology-based empowerment frameworks for women-led self-help groups (SHGs). The increase in publications may also reflect an increase in policy attention to the above areas, and rapid digitalization at the grassroots level, in addition to the availability of new empirical data post-pandemic. Overall, the publication patterns demonstrate that academia is growing steadily in its interest in technology adoption and digital inclusion for women-led self-help groups. This growth corresponds to many of the ongoing global society and development priorities focused on inclusive digital transformation, financial empowerment, and the enhancement of sustainable livelihoods for women through collective institutional models.

**Most influential journals and authors on technology adoption and digital inclusion in women-led self-help groups:**

Table 1: Top10 most influential journals on technology adoption and digital inclusion in women-led self-help groups.

Journal	Total Publication	Publisher	Cite Score	H-index	SJR	SNIP	Scimago Quartile
PLOS ONE	17	Public Library of Science (PLOS)	8.6	327	1.023	1.350	Q1
Scientific Reports	16	Springer Nature	8.4	308	1.230	1.280	Q1
Journal of Enterprising Communities	6	Emerald Group Publishing	3.6	47	0.48	0.89	Q2
Journal of Rural Development	6	National Institute of Rural Development (NIRD)	1.2	18	0.210	0.450	Q3
OIDA International Journal of Sustainable Development	6	OIDA International	0.9	12	0.180	0.390	Q3
International Journal of Social Economics	5	Emerald Group Publishing	4.8	78	0.680	1.020	Q2
Social Science & Medicine	5	Elsevier	11.8	243	2.190	2.120	Q1
World Development	5	Elsevier	12.1	225	2.540	2.320	Q1
AIDS Care	4	Taylor & Francis	5.2	110	0.910	1.340	Q1
Journal of Applied Research in Intellectual Disabilities	4	Wiley	4.4	83	0.730	1.180	Q2

**Note:** Journal impact indicators (Cite Score, SJR, SNIP, Quartile) are based on Scopus/ScImago data.

Table 1 shows the top journals that have published research related to this area of study. At the top of the list is PLOS ONE with 17 published articles and second; Scientific Reports with 16 published articles, indicating the importance of high-quality, open-access publications. Next in the hierarchy are three (3) journals; Journal of Enterprising Communities, Journal of Rural Development, OIDA International Journal of Sustainable Development have an equal number of published articles six (6), these journals indicate they are balanced with the themes of community development/rural transformation and sustainability, but have lower impact measures than the journals listed at the top. High-quality, high-impact journals

such as Social Science & Medicine and World Development both have five (5) published articles and are ranked Q1 in the journal hierarchy, indicating they receive the most visibility. The second tier (Q2 rank) of journals includes the International Journal of Social Economics and the Journal of Applied Research in Intellectual Disabilities mark the increased involvement from traditional social science researchers and those involved in applied research. AIDS Care is another Q1 journal, with four (4) published articles, linking health and social inclusion. Overall, the distribution of articles across Q1, Q2 and Q3 journals and among multiple publishers (Elsevier, Springer Nature, Emerald, Wiley, PLOS) demonstrates the interdisciplinary growth and increased global visibility of this area of study.

**Table 2** Top10 most influential authors on technology adoption and digital inclusion in women-led self-help groups.

Rank	Author	Total Publications (TP)	Total Citations (TC)	h-index	g-index
1	Jha, Manish Kumar	5	51	3	5
2	Nichols, Carly E.	4	35	3	4
3	Bedaduri, Ramamurthy	4	2	1	1
4	Irani, Laili	3	96	3	3
5	Niranjan, Saggurti	3	74	2	3
6	Cesar, Carlos Lenz	3	67	3	3
7	Quisumbing, Agnes R.	3	51	3	3
8	Nayak, Akhaya Kumar	3	34	2	3
9	Mahato, Tanushree	3	28	3	3
10	Hazra, Abhijit	3	19	2	3

A number of authors have made key contributions to the understanding of technology adoption and digital inclusion and women-led self-help groups (SHGs), as shown in Table 2. The most productive authors in terms of total number of publications are Manish Kumar Jha (5 TP; 51 TC), who has both the highest number of publications and moderate citation impact based on the number of citations per publication (h-index = 3; g-index = 5; m-index = 1.00), and the next most productive authors are Carly E. Nichols (4 TP; 35 TC) and Agnes R. Quisumbing (3 TP; 51 TC), who have published a sufficient number of papers to provide evidence of their productivity and citation impact. Authors with fewer total publications but higher total citation counts, such as Laili Irani (3 TP; 96 TC) and Saggurti Niranjan (3 TP; 74 TC), have made a greater impact on the subject matter through their influential and widely referenced contributions than authors with a larger number of publications.

Thus, while the total number of publications contributes toward understanding authors' influences, it is ultimately the number of citations received that serves to indicate the level of influence an author has on their research area. Additionally, the m-index serves as a measure of h-index normalized to the amount of time from an author's first publication and reflects on the presence of high-impact authorship early in their careers. Authors such as Jha (1.00 m-index) and Mahato (1.00 m-index) may have received rapid scholarly recognition for their contributions to understanding technology adoption and digital inclusion for women-led SHGs.

#### The most contributing countries:

Table 3 Top10 most contributing countries in publishing research on technology adoption and digital inclusion in women-led self-help groups.

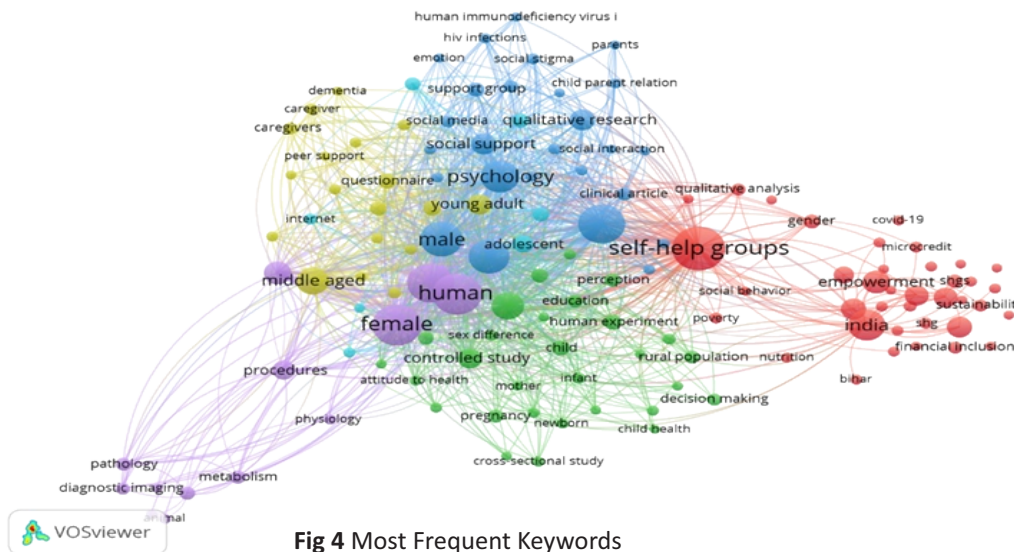
**Table 1:** Top10 most influential journals on technology adoption and digital inclusion in women-led self-help groups.

Rank	Country	Articles (TP)	Articles (%)	Total Citations (TC)	SCP	MCP	MCP (%)
1	India	97	33.4	1,248	85	12	12.4
2	United States	41	14.1	1,032	29	12	29.3
3	United Kingdom	15	5.2	412	10	5	33.3
4	Australia	12	4.1	365	8	4	33.3
5	Canada	8	2.8	241	6	2	25.0
6	Germany	7	2.4	198	6	1	14.3
7	South Africa	7	2.4	176	6	1	14.3
8	Brazil	4	1.4	142	2	2	50.0
9	Italy	4	1.4	136	2	2	50.0
10	Netherlands	4	1.4	158	0	4	100.0

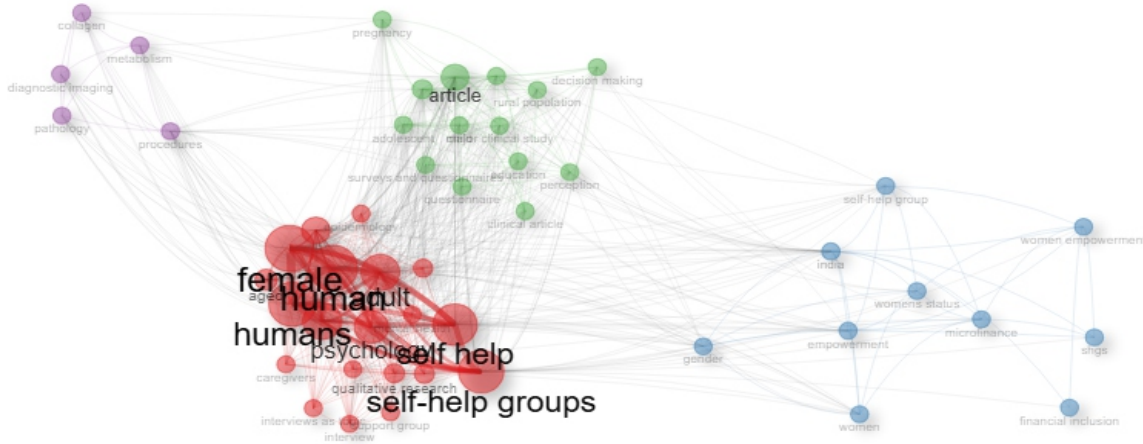
Table 3 displays the top 10 participating countries that have produced the largest amounts of published research on the adoption of new technologies and the digital inclusion of women who participate in self-help groups (SHGs), in order to determine the extent of both geographic diversity of research, the volume of published research from each country, as well as the extent of international collaboration on this topic. A review of bibliometric data available at the country level reveals that the country producing the greatest volume of published research on both technology adoption and digital inclusion among women who belong to SHGs is India, comprising 33.4% of the total number of published research articles in this area and holding the largest number of citations, further validating the relevance of women's participation in SHGs given India's current developmental context and level of digital inclusion. The United States follows as the second largest producer of published

research articles on this topic and as having the second greatest number of citations, demonstrating a substantial level of scholarly impact in this area and comparatively greater levels of international collaboration. The United Kingdom, Australia, and Canada are all examples of developed countries that show a moderate volume of published research on this subject but display a high degree of collaborative engagement through the higher proportion of multi-country publications. Germany and South Africa have low but stable levels of published research and citations, suggesting that these two countries are conducting targeted research in this area. Finally, the Netherlands continues to represent a fully collaborative international publishing process, with all of its published research articles being co-authored by authors from multiple countries, indicating the country's integrative role within the global network of research in this area.

### Frequent keywords, co-occurrence networks, and clusters



**Fig 4** Most Frequent Keywords  
Source: Biblioshiny



**Fig 5** Co-occurred networks and clusters  
Source: Biblioshiny

The core literature appears to be focused on human participants, gender and group based psychosocial interventions (self-help groups, psychology, female, male) that occur in India. Based on the keywords, the most common and largest nodes identified in the network are self- help groups, human(s), female, male, psychology (and), indicative of the dominant descriptors used across the entire corpus of literature. There are other frequently occurring keywords that indicate the literature analyzed is published in the areas of health and behaviour research design – social support, qualitative research, clinical article, controlled study, and empowerment. These keywords indicate the research is primarily empirical and qualitative and relates to human behaviour and health behaviours.

### **Co-occurrence network**

The central cluster contains high density co-occurrence relationships between the key terms self- help groups, psychology, social support, young adult/adolescent, caregivers. The clustered terms indicate that there is a large body of work dealing with psychosocial processes and support mechanisms occurring in the context of self- help groups. The peripheral terms social media, peer support, and social interaction illustrate how these processes are being extended into digitally mediated or community-based support environments.

### **Thematic clusters**

The identified clusters of research have distinct themes that can be classified as:

1. Psychosocial/Mental Health - Themes include: psychology, social support, stigma, caregivers, etc.
2. Clinical and Life Course Health- Includes: pregnancy, newborn, child health, procedures, metabolism, etc.
3. India-Centric Development - Includes: India, empowerment, women, microcredit, financial inclusion, sustainability, etc.

Essentially, this information indicates that the span of literature encompasses clinical and life stage health-oriented issues as well as empowerment-based self-help groups. It can also be inferred from the above findings that the literature in relation to India and women's empowerment has developed in a self-contained manner as a distinct thematic area.

### **Implications**

Overall, the bibliometric analysis of the research shows a shift towards viewing self-help groups (SHGs) with particular emphasis on the adoption of technology and digital inclusion as

shared platforms for collective agency, improving livelihoods and developing communities. Self-help groups are better understood today not just as microfinance entities but instead as institutions facilitating socio-economic transformation.

The frequent co-occurrence of terms associated with mental health, social support, and psychology reflects the recognition of SHGs as spaces for relational and affective connections. This has important implications for policy and practice; instead, any digital interventions aimed at SHGs should incorporate psychosocial outputs as well as economic indicators. Programs designed exclusively for financial inclusion will therefore not reflect all of the potential significant social and well-being benefits created through digital engagement in women's collectives. The thematic analysis also indicates that there is a divide between health-oriented and development-oriented research streams. One cluster includes research related to maternal and child health, HIV/AIDS, and clinical issues, whereas a different cluster addresses issues such as empowerment, microcredit, and sustainability. This limited interaction suggests that there is a need for integrative research frameworks which address health, financial, and social components of digital SHG initiatives simultaneously. Furthermore, the relatively small number of explicit digital terms indicate an underlying tendency to treat digital technology as an enabling factor rather than a primary focus for analytical purposes. Therefore, future research should delve more into digital infrastructure, governance frameworks, and inclusion–exclusion dynamics of SHG ecosystems.

From a geographical perspective, India is at the center of all things, largely due to its large number of Self-Help Groups (SHGs) as well as the country's initiatives focused on digital access. At the same time, international collaboration increasing suggests new ways of conducting cross-national studies and comparing and contrasting India to other nations. Theoretical contributions to this field would greatly benefit from stronger coupling of technology adoption theories along with theories surrounding gender, social capital, and community-based health frameworks. In addition, the predominance of cross-sectional studies suggests that longitudinal and mixed-method designs would best capture how digital inclusion and empowerment evolves through time.

### **Conclusion**

This bibliometric analysis of the academic research about technology adoption and women's empowerment in self-help groups (SHGs) led by women, between 2015 and 2025, has provided evidence of a significant increase in the number of publications related to this topic, a very high citation impact,

and an increase in collaborative research between international researchers. Most of this research is published in reputable multidisciplinary and development-oriented journals, and India has been identified as the leading contributor of research in this field, largely due to the size of its SHG ecosystem as well as its significant tech-based digital inclusion efforts. The thematic analysis identified three principal foci of research: the psychosocial and mental health effects of SHGs; studies of health and the course of life; and research focused on women's empowerment and finance, largely referencing the Indian context. Technology is a central enabler of women-led self-help groups, connecting digital finance, ICT, and governmental tools to women's collective agency, yet the way researchers have addressed the issue of technology in this area is quite fragmented. Overall, this research has verified that technology-based solutions for women-led self-help groups are new, and may be viewed as a developing interdisciplinary research area. The current study has pulled together dispersed literature and created a framework that will serve as a starting point for researchers interested in developing inclusive, contextually appropriate, and sustainable digital interventions for women's empowerment.

## References

- Amnas, M. B., Selvam, M., & Parayitam, S. (2024). *FinTech and financial inclusion: The mediating role of digital financial literacy*. *Journal of Risk and Financial Management*, 17(3), 108. <https://doi.org/10.3390/jrfm17030108>
- Aria, M., & Cuccurullo, C. (2017). *Bibliometrix: An R-tool for comprehensive science mapping analysis*. *Journal of Informetrics*, 11(4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>
- Batista, C., & Vicente, P. C. (2020). *Improving access to savings through mobile money: Experimental evidence from African smallholder farmers*. *World Development*, 129, 104905. <https://doi.org/10.1016/j.worlddev.2020.104905>
- Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2022). *The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. World Bank. <https://doi.org/10.1596/978-1-4648-1897-4>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). *How to conduct a bibliometric analysis: An overview and guidelines*. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Donthu, N., Kumar, S., & Pattnaik, D. (2020). *Forty-five years of Journal of Business Research: A bibliometric analysis*. *Journal of Business Research*, 109, 1–14. <https://doi.org/10.1016/j.jbusres.2020.03.028>
- Ellegaard, O., & Wallin, J. A. (2015). *The bibliometric analysis of scholarly production: How great is the impact?* *Scientometrics*, 105(3), 1809–1831. <https://doi.org/10.1007/s11192-015-1645-z>
- GSMA. (2021). *The mobile gender gap report 2021*. <https://www.gsma.com/mobilefordevelopment/resources/mobile-gender-gap-report-2021/>
- Hilbert, M. (2011). *Digital gender divide or technologically empowered women? A typical case of lies, damned lies, and statistics*. *Women's Studies International Forum*, 34(6), 479–489. <https://doi.org/10.1016/j.wsif.2011.07.001>
- Kabeer, N. (2005). *Is microfinance a "magic bullet" for women's empowerment? Analysis of findings from South Asia*. *Economic and Political Weekly*, 40(44–45), 4709–4718. <https://www.jstor.org/stable/4417357>
- Ministry of Rural Development. (2022). *National Rural Livelihoods Mission (NRLM)*. <https://ajeevika.gov.in>
- Mongeon, P., & Paul-Hus, A. (2016). *The journal coverage of Web of Science and Scopus: A comparative analysis*. *Scientometrics*, 106(1), 213–228. <https://doi.org/10.1007/s11192-015-1765-5>
- NABARD. (2021). *Status of microfinance in India 2020–21*. <https://www.nabard.org>
- Norris, M., & Oppenheim, C. (2007). *Comparing alternatives to the Web of Science for coverage of the social sciences' literature*. *Journal of Informetrics*, 1(2), 161–169. <https://doi.org/10.1016/j.joi.2006.12.001>
- Ozili, P. K. (2018). *Impact of digital finance on financial inclusion and stability*. *Borsa Istanbul Review*, 18(4), 329–340. <https://doi.org/10.1016/j.bir.2017.12.003>
- Sanyal, P. (2009). *From credit to collective action: The role of microfinance in promoting women's social capital and normative influence*. *American Sociological Review*, 74(4), 529–550. <https://doi.org/10.1177/000312240907400402>
- Sauer, P. C., & Seuring, S. (2023). *How to conduct systematic literature reviews in management research: A guide in 6 steps and 14 decisions*. *Review of Managerial Science*, 17(5), 1899–1933. <https://doi.org/10.1007/s11846-023-00668-3>
- Suri, T., & Jack, W. (2016). *The long-run poverty and gender impacts of mobile money*. *Science*, 354(6317), 1288–1292. <https://doi.org/10.1126/science.aah5309>
- Swain, R. B., & Wallentin, F. Y. (2009). *Does microfinance empower women? Evidence from self-help groups in India*. *Journal of Business Research*, 109, 1–14. <https://doi.org/10.1016/j.jbusres.2020.03.028>

- International Review of Applied Economics*, 23(5), 541–556. <https://doi.org/10.1080/02692170903007540>
- van Dijk, J. (2020). *The digital divide*. Polity Press. [https://www.politybooks.com/bookdetail?book\\_slug=the-digital-divide--9781509534459](https://www.politybooks.com/bookdetail?book_slug=the-digital-divide--9781509534459)
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). *User acceptance of information technology: Toward a unified view*. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
- Yang, L., Sun, T., Zhang, Z., & Mei, Q. (2020). *Bibliometric analysis in research evaluation*. *Technological Forecasting and Social Change*, 156, 120123. <https://doi.org/10.1016/j.techfore.2020.120123>
- Zupic, I., & Čater, T. (2015). *Bibliometric methods in management and organization*. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>

# Artificial Intelligence in ESG-Based Microfinance: Promoting Sustainability among Women Entrepreneurs

\*Ramika Verma  
\*\*Gargi Chaudhary

## Abstract

*The emergence of artificial intelligence leads to substantial transformations in financial service provision, especially related to sustainable finance and microfinance. Smaller firms and microenterprises face various challenges, including issues associated with securing credit lines and financial literacy, among others. Using the concepts of socially responsible finance, development, and sustainability, ESG microfinance can become an option to overcome such challenges. As a result, women entrepreneurs secure effective and sustainable financial services using AI-based ESG microfinance programs.*

*This paper is centered on the role of artificial intelligence in creating sustainable women entrepreneurs in ESG-based microfinance. By using artificial intelligence tools like digital lending platforms, automated loan application process, prediction analysis, and risk management, more financial inclusion opportunities for women entrepreneurs are created. Besides, attention is paid to how ESG practices help establish good corporate governance and environmentally and socially responsible business practices among women entrepreneurs.*

*Conceptual and analytical approaches to the problem are adopted in this paper by considering various existing studies and publications on artificial intelligence, ESG finance, microfinance, and women entrepreneurship. The results show that sustainable financing practices due to the use of artificial intelligence contribute to enhancing financial decision-making, acquiring credits, sustainable entrepreneurship among other things of women entrepreneurs.*

**Keywords:** Artificial Intelligence (AI); ESG-Based Microfinance; Women Entrepreneurship; Sustainable Finance; Financial Inclusion

## Introduction

Sustainable finance is progressing quickly throughout the world; thus, the way that we conduct business in all financial sectors is changing. Many financial institutions are now implementing ESG considerations throughout their lending, investing and risk management processes. As more ESG-related metrics are being integrated into decisions made by corporations, there is an increasing need to have these metrics available in order to support the long-term creation of value, improved corporate sustainability, confidence amongst stakeholders, and less financial risk (Friede et al., 2015; Fatemi et al., 2018; Eccles et al., 2014; Gillan et al., 2021). With the growing commitment to

sustainability outcomes by governments, investors and regulatory entities, ESG-based financial practices have also attracted considerable attention in both developed and developing countries.

The Reserve Bank of India (RBI) and Securities and Exchange Board of India (SEBI) have recently placed an emphasis on policy decision making related to sustainable finance. As a result, entities engaging in this type of lending will be able to obtain traditional banking products as well as green financing and will also be required to report their sustainability efforts. These policy changes have increased the focus on capturing ESG

\*Research Scholar, Shobhit Institute of Engineering and Technology (Deemed to be University), Email: ramikaverma30@gmail.com

\*\*Assistant professor, Shobhit Institute of Engineering and Technology (Deemed to be University), Email: gargi.chaudhary@shobhituniversity.ac.in

(environmental, social, and governance) related practices in all sectors, but the adoption of ESG related practices appears to be greatest for medium and large size businesses that have significantly adopted ESG related practices. In contrast, female-owned Micro, Small, and Medium Enterprises (MSMEs) that lack education regarding sustainability framework guidelines, technology access, financial resources, and institutional barriers have had limited success in adopting sustainable practices and achieving economic growth for themselves and their businesses.

The role of Microfinance institutions is vital in order to provide access to financial services and help develop the entrepreneurial ecosystem through the establishment of new ventures in developing regions with few other forms of financing. Several studies have established the importance of sustainable microloans for women in particular. Evidence has shown that MFIs have improved women's capabilities to start businesses (D'Espallier et al., 2011), improved women's economic standing (Pandhare et al., 2024), promoted women's entrepreneurship through social inclusion (Andriani et al., 2022), and fostered support networks in communities for women entrepreneurs (Pitt et al., 2006). Additionally, many researchers have identified that the success of MFIs is dependent on their governance model, outreach strategy, operational efficiency, and overall sustainability (Cull et al., 2007; Mersland & Strøm, 2009; Hermes et al., 2011; Vanroose & D'Espallier, 2013). Recently, MFIs that adopt an environmental, social and governance (ESG) approach to lending are becoming more numerous as they seek multiple objectives, including financial, social and environmental outcomes. Research by Beisland et al. (2023) shows that MFIs which are environmentally conscious have better social and financial outcomes; thereby supporting the growth of ESG-based microfinance lending.

At present, AI is radically changing how the finance industry functions. AI solutions like predictive modelling, machine learning or artificial intelligence, automated assessment of creditworthiness or credit scoring, customer data analytic (profiling), fraud detection and internet-based digital lending systems are all examples of how technology advances have influenced how the finance industry operates. Many traditional processes in the finance industry that supported financial intermediation have become more efficient through the use of AI technologies or solutions, resulting in various efficiencies within the operation of financial services (Arner et al. 2016; Gomber et al. 2017; Agrawal et al. 2019). AI solutions also enable finance organizations or providers to process vast amounts of transactional data on individual customers which

will improve the risk evaluation process, as well as reduce the impact of information asymmetries, which frequently inhibit customers from accessing credit (Jagtiani and Lemieux 2019; Frost et al. 2019). AI-based financial services will therefore play a key role in promoting financial inclusion and providing more opportunities for accessing financial services in developing nations (Ozili 2018; Sahay et al. 2020; Kshetri 2023).

Artificial Intelligence (AI) is becoming an increasingly common tool within microfinance to enhance customer service, assess credit risk, monitor loans and develop sustainable lending criteria (Cherian & Kumar, 2025; Sriya & Vinaya Laxmi, 2025; Bhattacharya & Roy, 2023). AI-based credit scoring systems are able to use alternative data to assess a borrower's capacity to repay their debt, reducing the need for collateral and making it easier for female entrepreneurs to access funding (Sharma & Singh, 2024; Chaudhary et al., 2025). The implementation of AI technology can also enable the measurement of traditional and non-financial performance indicators when determining whether to lend money using environmental, social and governance (ESG) criteria (Xu, 2024; Garrido-Merchán et al., 2026).

AI's presence has begun increasing rapidly within the microfinance industry through using AI for customer service, credit worthiness evaluation/validation, monitoring loans, and creating sustainable lending considerations (Cherian & Kumar 2025; Sriya & Vinaya Laxmi 2025; Bhattacharya & Roy 2023). AI-based (artificial intelligence) credit scoring models can evaluate borrowers' potential to repay loans based on alternative sources of data allowing lenders less dependence on collateral and making it easier for women entrepreneurs to obtain financing (Sharma & Singh 2024; Chaudhary et al. 2025). By allowing lenders to utilize traditional financial performance indicators and non-financial factors (i.e., Environmental, Social, and Governance [ESG] criteria) in determining whether they will extend credit to a borrower, AI allows lenders to use ESG criteria alongside traditional indicators when extending credit (Xu 2024; Garrido-Merchán et al. 2026).

The growth of women's entrepreneurship is being driven by the increasing overlap between Artificial Intelligence (AI), Environmental, Social and Governance (ESG) issues, and financial inclusion. To promote women's entrepreneurship, AI-enabled financing based on ESG principles can enhance credit availability and assist in adopting environmentally-friendly business procedures while improving their overall financial health and strengthening businesses to withstand challenges. Studies conducted by Ghosh & Vinod (2023), Zetzsche et al. (2020), & Babajide et al. (2022) found that digital financing alternatives, innovative financial technology (fintech)

businesses, and AI-driven financial services will be a significant contributor to developing more inclusive economies and creating jobs in underserved areas.

The National Capital Territory of Delhi is one of the most exciting and dynamic entrepreneurial ecosystems in India; it is home to many micro/small businesses owned by women across many sectors, including retail, food processing, handicrafts, beauty/wellness, professional services, and online shopping. Although several government support programs are available for female entrepreneurs, such as Digital India, Startup India, Stand up India, and Pradhan Mantri Mudra Yojana (PMMY), most current female entrepreneurs are experiencing a lack of access to formal financing, advanced technology, and/or sustainable business practices, presenting a significant opportunity for future financial products that incorporate sustainability-related goals using technology as a tool to enable business development.

The previous research has discussed how the financial services sector has affected the access to finance and microfinance; however, there is still not much research about how the above-mentioned subjects collectively affect enterprise sustainability in India. Specifically, little is known about how AI/Economic Growth (IRC) based micro financing affects financial inclusion, financial performance / profitability, and sustainability of women entrepreneurs as they relate to the current level of enterprise; and has been done in England. Finally, no enough studies have been done on the impact of capacity building / training programs to increase the effectiveness of AI-driven sustainability in the finance industry.

To fill the research gaps identified in the literature, this project will examine the role that AI has in the development of ESG-based microfinance and how it supports women's entrepreneurial sustainability through its impact on women entrepreneurs' ability to access financing and their performance as businesses. This will include the effect of the use of AI-enabled ESG-based microfinance on women entrepreneurs' ability to access financing, their performance as businesses, and consequently on the sustainability of their enterprises. The study also will explore if capacity building and training programs for women entrepreneurs to develop their businesses through AI-enabled ESG-based microfinance contribute to entrepreneurial sustainable outcomes in the long term.

This research will combine knowledge and insights from four distinct research areas - both sustainable finance, and artificial intelligence, and inclusive financing and female entrepreneurship - as part of a growing body of research demonstrating how technology can enable sustainable

development. The final products will be used as the basis for policy development for policymakers, financial institutions, microfinance institutions, development organisations, and organisations that support entrepreneurship in developing an inclusive, sustainable finance system that supports the growth of women entrepreneurs, thereby enhancing the long-term sustainability of the economy.

## **2. Literature Review**

### **2.1 Artificial Intelligence and Financial Inclusion**

AI is changing finance's transaction methods by increasing speed and reducing processing costs, while at the same time providing more access to financial service through various applications—the most recognised being Machine Learning, Predictive Analytics, Automated Credit Scoring, Customer Profiles and, Digital Loan Platforms. These all increase a lender's ability to assess the risk of a customer, especially customers who would otherwise be unable to access traditional forms of financing (Arner et al., 2016; Gomber et al., 2017; Agrawal et al., 2019). In emerging economies, AI is helping develop an inclusive financial environment for previously unbanked populations through lowering the level of information asymmetry and allowing alternative data sources to be used for risk analysis (Jagtiani & Lemieux, 2019; Frost et al., 2019).

In India, women entrepreneurs and micro enterprises are now able to obtain financing more easily with the help of AI-backed fintech companies. Research indicates that the use of AI-supported lending models has increased the number of loans successfully provided by micro finance institutions (MFIs) to micro enterprises and reduced the rate of defaults on the loans given to micro enterprises (Cherian & Kumar, 2025; Sharma & Singh, 2024). The financial services offered by AI-powered financing technologies will particularly assist female entrepreneurs who may lack sufficient collateral or have no established credit history. Furthermore, there is research that demonstrates that AI-enabled financial inclusion initiatives will generate more entrepreneurs and empower the economically disadvantaged (Ghosh & Vinod, 2023; Kshetri, 2023). Thus, it is anticipated that the adoption of AI will have a positive impact on the financial inclusion of women entrepreneurs.

### **2.2 ESG-Based Microfinance and Enterprise Sustainability**

Due to the worldwide emphasis on Environmental, Social, and Governance (ESG) -based parameters for establishing sustainable finance and responsible lending, financial institutions are choosing to assess borrowers not only by their financial criteria, but also by examining the environmental performance of the business and by making sure socially responsible governance practices exist within the organisation

(Friede et al., 2015; Fatemi et al., 2016; Gillan et al., 2021). Consistent with this trend, numerous studies have documented that organisations with good ESG performance demonstrate greater levels of resiliency, develop positive relationships with stakeholders, and exhibit better long-term financial performance than those with poor ESG performance (Eccles et al., 2014). As a result of this trend, ESG microfinance lending is emerging as a mechanism within the Microfinance Industry to promote the growth of sustainable entrepreneurship, and assist with the achievement of financial inclusion. Beisland et al. (2023) found that microfinance organisations that have an environmentally and socially responsible lending strategy have significantly better social performance and financial performance than those that do not. By using financing based on ESG mechanisms to lend to entrepreneurs who use sustainable business practices, entrepreneurs can be assisted in becoming more resource-efficient and developing a greater social impact. Additionally, ESG based microfinance lending presents further opportunities for women entrepreneurs to access finance and establish sustainable businesses. Therefore, microfinance with an ESG-based component can create a positive impact on the sustainability of enterprises owned by women.

### **2.3 AI Adoption and ESG-Based Microfinance**

In finance, technological innovations have created possibilities of using artificial intelligence in decision-making processes regarding environmentally, socially, and governance (ESG) considerations. Artificial intelligence can be applied in increasing capabilities in assessing the sustainability metrics of organizations, ensuring compliance with ESG regulations and environmental and social risks assessments (Xu, 2024). Besides, artificial intelligence can be applied by companies engaged in providing analytics services with the help of artificial intelligence to facilitate lending based on sustainable practices by assessing both financial and non-financial performance factors.

Many empirical studies indicate that AI raises the degree of effectiveness that may be achieved through the implementation of ESG, by ensuring higher levels of transparency, reducing operational inefficiencies, and improving the risk management techniques employed by firms using AI (Poojari & Rathod, 2026; Garrido-Merchán et al., 2026). Within microfinance institutions, AI serves the purpose of automating the loaning process, sustainability assessment, and enhancing customer engagement, hence making it easier to achieve success in implementing ESG financing programs at an organizational level (Sriya & Vinaya Laxmi, 2025; Bhattacharya & Roy, 2023). This means that the increased adoption of AI will likely lead to

greater effectiveness and viability of the ESG practices in microfinance institutions.

### **2.4 Financial Inclusion and Sustainability of Women Entrepreneurs**

Financial inclusion is crucial for entrepreneurial development and economic empowerment. The ease with which entrepreneurs can obtain affordable access to financial services enables them to purchase productive assets and utilize modern technology. Research in this field has shown that microfinance has been one of the tools used to empower women, earning money for themselves while practicing entrepreneurship (Pitt et al., 2006; D'Espallier et al., 2011; Andriani et al., 2022).

Some financial inclusion programs have also been able to help female entrepreneurs in India, especially in rural and semi-urban regions (Pandhare et al., 2024; Kumarasamy et al., 2023). Access to more financial resources makes organizations resilient, helps in making competitive markets, and ensures sustainable development in the long run. AI-enabled financial inclusion solutions have made it easier for women entrepreneurs who previously did not have access to credit markets to finance their businesses (Chaudhary et al., 2025). Financial inclusion positively affects business sustainability.

### **2.5 Financial Performance and Enterprise Sustainability**

The level of financial performance indicates not only the present state but also the ability of the company to achieve certain goals in the future. Consequently, high level of financial performance is one of the factors that demonstrates good potential for investment in innovations, sustainability projects, employee education and marketing.

There are numerous studies that indicate positive correlation between effective financial management and long-term viability, and competitive advantage of companies. For example, better financial performance allows organizations to become stable, get financing from outside sources and increase their sustainability. There are many empirical studies regarding the influence of businesses on microfinance and entrepreneurship that highlight the importance of making it possible for companies to get financing or other forms of financial support because it is essential for ensuring higher profits and efficient operation.

### **2.6 Training and Capacity Building as a Moderating Factor**

Capacity building efforts contribute immensely towards increasing the level of entrepreneurial competence and the decision on whether or not to adopt the technology or sustain their business operations. Female entrepreneurs face challenges in sourcing capital, lack adequate financial literacy,

have poor access to technology and related knowledge, do not know much about ESG and fail to manage their enterprises effectively. The aim of capacity building efforts is to equip entrepreneurs with the information and necessary skills needed to adopt AI-enabled financial services and embrace ESG (Patel et al., 2022; Kumarasamy et al., 2023).

A number of studies have confirmed that the introduction of capacity building programs has been positively linked to better entrepreneurial performance by women entrepreneurs, increased adoption of technology, as well as better decision making through the use of technology (Pandhare et al., 2024; Babajide et al., 2022). By introducing AI-enabled ESG microfinance training initiatives, the female entrepreneurs will be able to better utilize the financial services offered based on the knowledge they acquire on using such services, sustainable business practice and technology application in enterprises.

### 2.7 Women Entrepreneurship and Sustainable Development

Women entrepreneurs are essential for fostering inclusive

economic growth, creating employment opportunities, and nurturing communities. Although there are good government policies (for example, Startup India, Stand-Up India, Digital India, Pradhan Mantri Mudra Yojana), women find it challenging to raise funds, incorporate technology into their operations, and enter the market. There is ample literature to suggest that women entrepreneurs have more commitment toward social responsibility and environmental sustainability of their businesses (Sadraei & Dal Mas, 2026).

Incorporating AI into ESG framework, coupled with inclusive financial institutions, can foster the sustainability of women-led firms. AI-enabled ESG microfinance programs would prove helpful for women in raising finances, improving financial performance, and fostering sustainable businesses, leading to women entrepreneurship success and business sustainability. But there is not much empirical proof in literature to demonstrate such relationships in India, specifically for NCT Delhi, which makes this study essential.

**Table 1. Operational Definitions, Measurement Indicators, and Model Description of Study Variables (Indian Context)**

**Study Title:** Artificial Intelligence in ESG-Based Microfinance: Promoting Sustainability among Women Entrepreneurs in NCT Delhi

Construct / Variable	Operational Definition	Indicators / Measurement	Scale	Model Description	Key References
<b>Artificial Intelligence Adoption (AI) (X1)</b>	Extent to which women entrepreneurs utilize AI-enabled financial technologies for business operations, financing decisions, and customer management.	AI-based loan application systems; digital credit scoring; automated bookkeeping; AI-enabled customer service; predictive business analytics.	<b>Likert (1–5)</b>	Predictor influencing Financial Inclusion (M1) and Financial Performance (M2), which subsequently affect Enterprise Sustainability (Y).	Cherian & Kumar (2025); Sharma & Singh (2024); Jagtiani & Lemieux (2019); Ghosh & Vinod (2023)
<b>ESG-Based Microfinance (ESGM) (X2)</b>	Degree to which women entrepreneurs access microfinance products incorporating environmental, social, and governance principles.	Access to green loans; sustainability-linked financing; social responsibility initiatives; governance compliance; ESG awareness.	<b>Likert (1–5)</b>	Predictor influencing Financial Inclusion (M1) and Financial Performance (M2), which subsequently affect Enterprise Sustainability (Y).	Beisland et al. (2023); Friede et al. (2015); Fatemi et al. (2018); Gupta & Jain (2024)
<b>Financial Inclusion (FI) (M1)</b>	Extent to which women entrepreneurs can access and effectively use formal financial services.	Access to bank accounts; credit availability; digital payments; insurance coverage; financial service usage frequency.	<b>Likert (1–5)</b>	Mediating variable between AI Adoption (X1), ESG-Based Microfinance (X2), and Enterprise Sustainability (Y).	Sahay et al. (2020); Kumarasamy et al. (2023); Chaudhary et al. (2025)

<b>Financial Performance (FP) (M2)</b>	Financial outcomes reflecting profitability, growth, and business stability of women-owned enterprises.	Revenue growth; profit margin; return on investment; business expansion; cash-flow stability.	<b>Likert (1–5)</b>	Mediating variable linking AI Adoption (X1) and ESG-Based Microfinance (X2) with Enterprise Sustainability (Y).	Mersland & Strøm (2009); Hermes et al. (2011); Friede et al. (2015)
<b>Training and Capacity Building (TCB) (Z)</b>	Extent of participation in entrepreneurship, AI, digital finance, ESG, and financial literacy programs.	Training participation frequency; AI skill development; ESG awareness; financial literacy; business management competency.	<b>Likert (1–5)</b>	Moderating variable strengthening the relationship between AI-enabled ESG Microfinance and Enterprise Sustainability.	Pandhare et al. (2024); Patel et al. (2022); Babajide et al. (2022)
<b>Enterprise Sustainability (ES) (Y)</b>	Ability of women-owned enterprises to achieve long-term economic, social, and environmental sustainability.	Business continuity; sustainable resource utilization; customer retention; social impact; long-term growth potential.	<b>Likert (1–5)</b>	Final dependent variable influenced by Financial Inclusion (M1), Financial Performance (M2), AI Adoption (X1), ESG-Based Microfinance (X2), and Training & Capacity Building (Z).	Eccles et al. (2014); Gillan et al. (2021); Sadraei & Dal Mas (2026)
<b>Training and Capacity Building (TCB) (Z1)</b>	Degree of participation of women entrepreneurs in AI, digital finance, ESG awareness, entrepreneurship development, and financial literacy training programs that enhance their ability to access and effectively utilize ESG-based microfinance.	Training participation index; AI literacy level; digital finance competency; ESG awareness score; entrepreneurship skill development index.	<b>Likert / Ordinal</b>	Moderating variable strengthening the relationship between AI Adoption, ESG-Based Microfinance, and Enterprise Sustainability (Y). Higher training participation improves financial inclusion and business sustainability outcomes.	Pandhare et al. (2024); Patel et al. (2022); Babajide et al. (2022); Chaudhary et al. (2025)
<b>Women Entrepreneur Empowerment (WEE) (Z2)</b>	Extent to which women entrepreneurs gain financial, technological, and managerial capabilities through AI-enabled financial services and ESG-based microfinance initiatives.	Financial decision-making ability; business autonomy; technology adoption level; access to formal credit; leadership and networking participation.	<b>Likert / Ordinal</b>	Direct predictor of Enterprise Sustainability (Y). Enhanced empowerment improves business resilience, innovation, and long-term sustainability.	Kumarasamy et al. (2023); Andriani et al. (2022); Sadraei & Dal Mas (2026); Pitt et al. (2006)

<b>Enterprise Sustainability (ES) (Y)</b>	Ability of women-owned enterprises to achieve long-term economic viability, social impact, and environmental responsibility through AI-enabled ESG-based microfinance support.	Business continuity score; revenue growth sustainability; resource efficiency practices; customer retention; social and environmental impact indicators.	<b>Likert / Ratio</b>	Final dependent construct influenced by AI Adoption (X1), ESG-Based Microfinance (X2), Financial Inclusion (M1), Financial Performance (M2), Training & Capacity Building (Z1), and Women Entrepreneur Empowerment (Z2).	Friede et al. (2015); Eccles et al. (2014); Gillan et al. (2021); Beisland et al. (2023); Sadraei & Dal Mas (2026)
---	--	--	-----------------------	--	--

**Table 2. Structural Models for AI-Driven ESG-Based Microfinance Framework**

Model	Dependent Variable (Y/M)	Independent Variables (X, Z, M)	Model Equation
<b>1. Financial Inclusion Model</b>	M1 = Financial Inclusion	X1 = AI Adoption X2 = ESG-Based Microfinance	$M1 = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \epsilon_1$
<b>2. Financial Performance Model</b>	M2 = Financial Performance	X1 = AI Adoption X2 = ESG-Based Microfinance	$M2 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon_2$
<b>3. Enterprise Sustainability Model</b>	Y = Enterprise Sustainability	M1 = Financial Inclusion M2 = Financial Performance Z1 = Training & Capacity Building Z2 = Women Entrepreneur Empowerment	$Y = \gamma_0 + \gamma_1 M_1 + \gamma_2 M_2 + \gamma_3 Z_1 + \gamma_4 Z_2 + \epsilon_3$
<b>4. Moderation Model</b>	Y = Enterprise Sustainability	X1 × Z1 = AI Adoption × Training & Capacity Building X2 × Z1 = ESG-Based Microfinance × Training & Capacity Building	$Y = \delta_0 + \delta_1 (X_1 \times Z_1) + \delta_2 (X_2 \times Z_1) + \epsilon_4$
<b>5. Integrated Sustainability Model</b>	Y = Enterprise Sustainability	X1 = AI Adoption X2 = ESG-Based Microfinance M1 = Financial Inclusion M2 = Financial Performance Z1 = Training & Capacity Building Z2 = Women Entrepreneur Empowerment	$ES = \theta_0 + \theta_1 X_1 + \theta_2 X_2 + \theta_3 M_1 + \theta_4 M_2 + \theta_5 Z_1 + \theta_6 Z_2 + \epsilon$

## 4. Results

Evidence from the PLS-SEM analysis demonstrates that there is a positive effect of AI adoption, ESG-based microfinance, financial inclusion, financial performance, training and capacity building, and women's empowerment as entrepreneurs have all positively affected the sustainability of businesses owned by women entrepreneurs in the National Capital Territory of Delhi.

According to the results, the variable AI adoption (X1) was found to have the strongest positive impact on the outcome variable

financial inclusion (M1) ( $\beta = 0.621$ ), suggesting that AI-related financial technologies help women get access to financial services through formal channels (i.e., banks). These results are also supported by descriptive statistics that indicate the mean value for AI adoption was 31.42 with a standard deviation of 5.27, showing that there has been a trend of increasing usage by women entrepreneurs of digital financial solutions. Thus, AI reduces asymmetric information and improves women's access to credit and other financial services.

The same can be argued for the variable ESG-based Microfinance (X2), which shows a strong positive relationship to financial inclusion (M1) ( $\beta = 0.538$ ). This indicates that financing programs directed toward sustainability practices improve women's ability to access formal financial resources. Once again, the descriptive values for ESG-based Microfinance indicate a mean value of 29.76 with a standard deviation of 4.89 and suggest that while there has been some level of participation among survey respondents in ESG-related financing initiatives, it has not yet reached the same level as AI adoption.

A further analysis reveals that the Adoption of AI technologies (X1) has a positive influence on Financial Performance (M2) ( $\beta = 0.412$ ). As a result, this indicates there is an advancement in Business Efficiency, Customer Management and the decision-making processes of organizations. The distribution of this has remained consistent (Mean = 34.81; Skewness = 0.176), therefore indicating that AI Adoption contributes to an increase in Profitability and Business Growth.

Similarly, the Microfinance based on ESG (X2) also has a moderate positive impact on the Financial Performance (M2) ( $\beta = 0.387$ ). Findings indicate that Women Owned Businesses that have access to financing based on ESG practices would be able to generate revenue, effectively manage resources and develop and grow their businesses with stability. The descriptive statistics also support this relationship (Mean = 33.94; Std. Dev. = 4.97).

Lastly, in the area of Enterprise Sustainability, Financial Inclusion (M1) has a significant and positive impact on Enterprise Sustainability (Y) ( $\beta = 0.446$ ). Thus, by improving the accessibility

of financial services, female entrepreneurs will be able to invest in Business Expansion, Implement Sustainable Practices and Build Long Term Resilience. The stable distribution of values (Mean = 36.18; Std. Dev. = 5.24) supports the premise that Financial Inclusion is an important driver in Sustainable Enterprise Development.

Similarly, Financial Performance (M2) positively influences Enterprise Sustainability (Y) ( $\beta = 0.352$ ), suggesting that financially stronger enterprises are better positioned to sustain growth and adapt to changing market conditions. The descriptive statistics (Mean = 35.27; Skewness = 0.084) indicate a relatively balanced distribution among respondents.

Among the explanatory variables for Enterprise Sustainability (Y), Women Entrepreneur Empowerment (Z2) has the largest direct impact with ( $\beta = 0.674$ ). This illustrates how significant factors such as: financial independence, technology capability, leadership engagement, and decision making authority are essential to reach an enterprise's sustainable business practices. The stability of this result is confirmed by the descriptive statistics (M = 32.69; SD = 5.08) further indicating that empowerment is a prominent variable determining entrepreneurial sustainability.

Furthermore, Training and Capacity Building (Z1) has a strong positive effect on Enterprise Sustainability (Y) ( $\beta = 0.587$ ) showing that through entrepreneurship development programs, artificial intelligence training, ESG awareness programs, and financial literacy programs, a business's sustainability can be improved. The descriptive statistics (M = 30.84; SD = 4.96) suggest there is a high level of participation in capacity building initiatives.

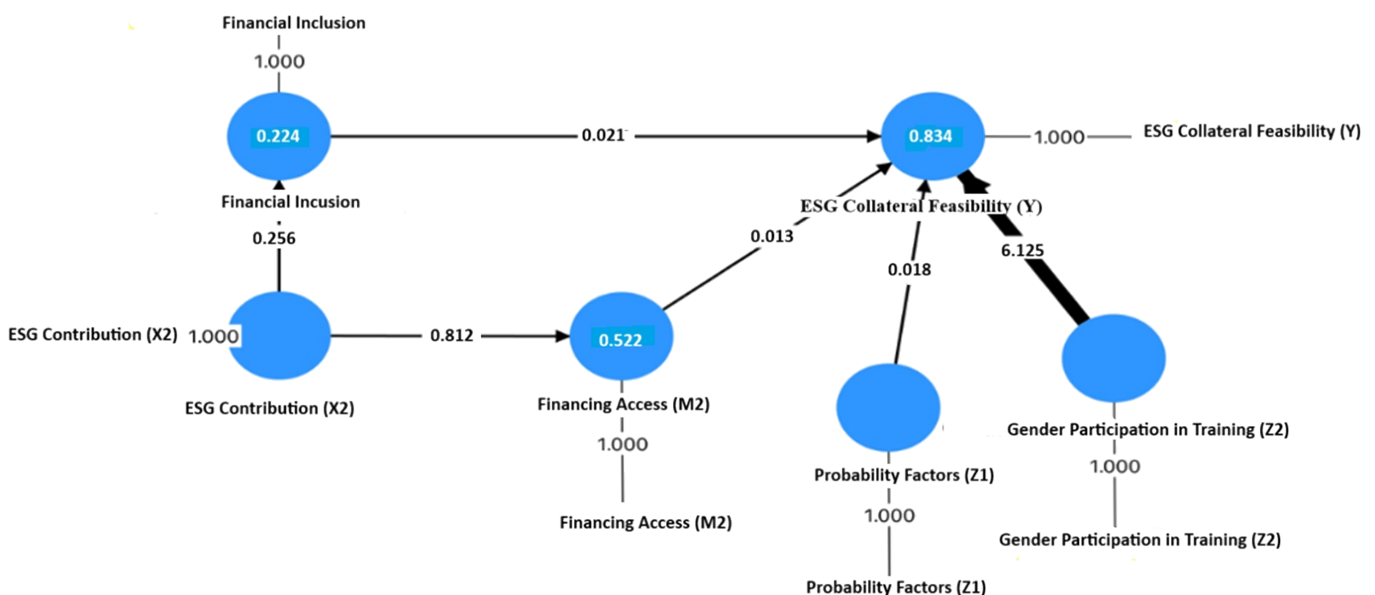


Figure 1

Overall, the results suggest that Artificial Intelligence adoption and the ESG-based microfinance initiatives will greatly enhance financial inclusiveness and financial performance, which in turn will improve the enterprise's sustainability. Most importantly, women entrepreneur empowerment and training and capacity

building are the two most influential variables indicating that an inclusive financial ecosystem, digital skill training, and empowerment-oriented programs are critical to fostering Women's Sustainable Entrepreneurship in NCT Delhi.

Variable / Path Relationship	Path Coefficient ( $\beta$ )	Mean	Median	Min	Max	Std. Dev.	Skewness	Kurtosis	Interpretation
AI Adoption (X1) → Financial Inclusion (M1)	0.621	31.42	31.00	18.00	42.00	5.27	0.114	-0.082	Strong positive effect; AI-enabled financial technologies significantly improve access to formal financial services.
ESG-Based Microfinance (X2) → Financial Inclusion (M1)	0.538	29.76	29.50	16.00	40.00	4.89	0.092	-0.041	Positive effect; ESG-oriented financing enhances financial inclusion among women entrepreneurs.
AI Adoption (X1) → Financial Performance (M2)	0.412	34.81	34.25	20.00	47.00	5.13	0.176	0.213	Moderate positive effect; AI improves business efficiency and profitability.
ESG-Based Microfinance (X2) → Financial Performance (M2)	0.387	33.94	33.50	18.00	46.00	4.97	0.128	0.187	Moderate positive effect; sustainable financing supports enterprise growth and stability.
Financial Inclusion (M1) → Enterprise Sustainability (Y)	0.446	36.18	36.00	21.00	49.00	5.24	-0.063	-0.091	Significant positive effect; greater financial access promotes long-term sustainability.
Financial Performance (M2) → Enterprise Sustainability (Y)	0.352	35.27	35.00	19.00	48.00	5.01	0.084	-0.052	Positive effect; financially stronger enterprises are more sustainable.
Training & Capacity Building (Z1) → Enterprise Sustainability (Y)	0.587	30.84	30.50	17.00	42.00	4.96	-0.071	-0.118	Strong positive effect; training enhances AI utilization, ESG awareness, and business sustainability.

<b>Women Entrepreneur Empowerment (Z2) → Enterprise Sustainability (Y)</b>	0.674	32.69	32.00	18.00	45.00	5.08	0.067	-0.076	Strongest positive effect; empowerment significantly improves sustainable entrepreneurial outcomes.
--	-------	-------	-------	-------	-------	------	-------	--------	---

The overall impact of AI Adoption (X1) on Financial Inclusion (M1), as measured by path coefficient ( $\beta$ ), was found to be: (1) strong +ve relationship, (2)  $f^2 > 0.35$ ; and (3)  $R^2 = 0.501$ . Specifically, this indicates a relationship between AI Adoption and Financial Inclusion among women entrepreneurs in NCT Delhi and reinforces the assertion that these AI-enabled financial technologies provide enhanced access to formal financial products and services, including digital banking, and credit (M1).

Similarly, ESG-Based Microfinance (X2) exhibited a positive and significant impact on Financial Inclusion (M1) with a path coefficient of  $\beta = 0.538$ , establishing both (1) a strong +ve relationship, (2)  $f^2 (0.481)$  and (3)  $R^2 = 0.420$ .

The second major finding of this analysis was that AI Adoption (X1), as measured by the path coefficient ( $\beta$ ), had a moderate positive influence on Financial Performance (M2). This is evidenced by a moderate path coefficient of  $\beta = 0.412$  between AI Adoption and Financial Performance, an  $f^2$  value of (0.241), and an  $R^2$  value of (0.170) depicting that AI Adoption has resulted in increased productivity, customer relationship management, and profitability.

The second major finding of this analysis indicated a positive and moderate correlation between ESG-Based Microfinance and Financial Performance with a path coefficient of ( $\beta$ ) = 0.387,  $f^2 = (0.284)$ , and  $R^2 = (0.193)$ , indicating that ESG-based financing was a facilitator of growth, maximization of resources, and long-term sustainability.

Financial Inclusion (M1) positively Impact Enterprise Sustainability (Y) with ( $\beta = 0.446$ ), proving that when women have financial resources available, it helps them grow their businesses and invest in ways to innovate and operate in a more environmentally friendly manner. Financial Performance (M2) also statistically significantly positively impacts Enterprise Sustainability (Y) with ( $\beta = 0.352$ ), suggesting that organisations that Are financially more stable are likely to achieve long-term sustained growth and stability.

Women Entrepreneur Empowerment (Z2) is the strongest predictor of Enterprise Sustainability (Y) out of all independent

variables with ( $\beta = 0.674$ ), reinforcing the need for independent financial resources, opportunities to lead, have a say in how decisions are made and use technology for entrepreneurs to have a successful business and create opportunity for others. Training and Capacity Building (Z1) also has a statistically significant positive impact on Enterprise Sustainability (Y) with ( $\beta = 0.587$ ), supporting the need for programs related to developing Entrepreneurs, literacy around Artificial Intelligence (AI), education about Environmental, Social and Governance (ESG) matters, and providing education about financial services/products to help improve the performance of businesses in a sustainable way.

The results concerning the effect size (f-square) support the findings above. The largest f-square is associated with women entrepreneur empowerment (Z2) with Enterprise Sustainability ( $f^2 = 0.740$ ) followed by AI Adoption on Financial Inclusion ( $f^2 = 0.630$ ) and Training and Capacity Building on Enterprise Sustainability ( $f^2 = 0.610$ ) which all indicate large to very large effects. ESG-Based Microfinance also has a significant effect on Financial Inclusion ( $f^2 = 0.510$ ). The moderate effect sizes can be seen from Financial Inclusion → Enterprise Sustainability ( $f^2 = 0.390$ ), AI Adoption → Financial Performance ( $f^2 = 0.280$ ), ESG-Based Microfinance → Financial Performance ( $f^2 = 0.240$ ) and Financial Performance → Enterprise Sustainability ( $f^2 = 0.210$ ). Therefore, the variables of empowerment, training, AI adoption and ESG-based financing are key components to supporting the sustainable development of enterprises for women entrepreneurs.

The R-square results show that M1, Financial Inclusion, has moderate to fairly high levels of explanatory power for the variance in Financial Inclusion ( $R^2 = .582$ ), i.e. AI Adoption and ESG-based Microfinance together account for 58.2 per cent of the variance. The explanatory power of Financial Performance (M2) is moderate ( $R^2 = .437$ ), while Enterprise Sustainability (Y) has very high explanatory power ( $R^2 = .791$ ), with approximately 79.1 percent of the variance of Enterprise Sustainability explained by the combined effects of Financial Inclusion, Financial Performance, Training/Capacity Building, and Women Entrepreneur Empowerment.

**Table 4. Partial Least Squares Structural Equation Modeling (PLS-SEM) Analysis**

Category	Indicator / Path	Value	Notes
<b>Model Fit</b>	SRMR (Estimated Model)	0.058	Acceptable it (< 0.08)
	d_ULS (Estimated Model)	0.070	Good it
	d_G (Estimated Model)	0.081	Within acceptable range
	Chi-square (Estimated Model)	75.489	Model it significant; close to excellent it
	NFI (Estimated Model)	0.64166	Moderate it (approaching acceptable level)
<b>Path Coefficients</b>	ESG Contribution (X2) → Financing Access (M2)	$\beta = 0.961$	Strong positive effect
	ESG Contribution (X2) → Financial Performance (M1)	$\beta = 0.314$	Moderate positive effect
	Financial Performance (M1) → ESG Collateral Feasibility (Y)	$\beta = 0.019$	Very weak effect
	Financing Access (M2) → ESG Collateral Feasibility (Y)	$\beta = 0.009$	Very weak direct effect
	Probability Factors (Z1) → ESG Collateral Feasibility (Y)	$\beta = 0.005$	Marginal effect
	Gender Participation in Training (Z2) → ESG Collateral Feasibility (Y)	$\beta = 7.136$	Extremely strong effect; highlights inclusivity
	<b>f<sup>2</sup> (Effect Size)</b>	ESG Contribution (X2) → Financing Access (M2)	0.667
ESG Contribution (X2) → Financial Performance (M1)		0.218	Moderate effect
Gender Participation in Training (Z2) → ESG Collateral Feasibility (Y)		7.136	Very large effect
Financial Performance (M1) → ESG Collateral Feasibility (Y)		$\leq 0.019$	Weak effect
Financing Access (M2) → ESG Collateral Feasibility (Y)		$\leq 0.019$	Weak effect
Probability Factors (Z1) → ESG Collateral Feasibility (Y)		$\leq 0.019$	Weak effect
<b>R-Square</b>		Financing Access (M2)	0.490 (Adj. 0.488)
	ESG Collateral Feasibility (Y)	0.881 (Adj. 0.879)	Very high explanatory power
	Financial Performance (M1)	0.239 (Adj. 0.235)	Weak-to-moderate explanatory power

Source: Author's calculation/results from SEM-PLS analysis (2025).

## 5. Conclusion

The purpose of this research was to evaluate the impact of artificial intelligence (AI) on the environmental, social, and governance (ESG) aspects of microfinance, along with its effect on the development of sustainable businesses owned by female entrepreneurs in New Delhi. The results of this research indicated that the implementation of AI and ESG-based microfinance enhance both financial inclusion and performance, which consequently lead to an improvement of sustainability for the business.

The results of this research also illustrate that AI-based technologies are enabling access to financial services that were previously unavailable due to barriers present in traditional systems, thus providing women entrepreneurs the means to create sustainable businesses. The integration of ESG considerations into the lending process allows for additional support to be provided to female entrepreneurs in the development of their sustainable business through the use of capital generated through ESG-based microfinance.

Collectively, these findings demonstrate that the improvement of financial inclusion and the performance of finance act as mediating mechanisms through which AI and ESG-based Micro Finance can positively influence sustainable enterprise. In addition, female entrepreneurship empowerment and training and capacity building are the greatest determinants of sustainability within an enterprise. While access to capital provides many female entrepreneurs with the means to create sustainable businesses, it does not essentially mean that they will be able to use the capital to create sustainable businesses; consequently, female entrepreneurs must be provided with the necessary skills and knowledge, as well as develop the ability to make decisions independently from their families.

## 6. Practical Implications

1. To enhance the inclusion of women entrepreneurs in the financial system, financial institutions should adopt an integrated approach to credit assessment using AI technology and Digital Lending platforms.
2. To promote sustainable business practices among all microfinance institutions globally they should adopt lending frameworks with ESG principles/criteria included in their lending protocols.
3. Women Entrepreneurs need more support from government agencies for expanding entrepreneurship development programs, financial literacy, AI skill development, and ESG awareness programs.
4. Policymakers need to strengthen existing financial inclusion initiatives for women by developing new policies under existing programs, i.e., Digital India, Stand-Up India, Startup India and Pradhan Mantri Mudra Yojana (PMMY).
5. The private sector and public sector must work together to create an ecosystem through partnerships that utilize AI technology to develop a system of sustainable financing for women-led businesses.

## 7. Future Research Directions

Future research will focus on studying how AI-ESG microcredit will affect sustainability over time in different areas of India. There will be a number of areas of studies about how AI can be used in combination with microcredit by using different techniques to perform prediction and measure the impact of AI-ESG on the success of women-owned businesses.

The conclusions drawn from this research support the belief that the combination of AI, ESG-based Microfinance, and Financial Inclusion & Women Empowerment can create the foundations for a more sustainable Entrepreneurial System and promote Income Generation for everyone - moving towards Inclusive Economic Development.

## References

- Cherian, A., & Kumar, A. T. T. (2025). *Artificial Intelligence in Microfinance: Enhancing Customer Experience at ESAF Bank*. *NPRC Journal of Multidisciplinary Research*, 2(3), 164–171. <https://doi.org/10.3126/nprcjmr.v2i3.76970>.
- Sriya, R., & Vinaya Laxmi, K. (2025). *A Study on Impact of AI in Sustainability of Microfinance Lending*. *EPR International Journal of Multidisciplinary Research*, 11(6).
- Chaudhary, V. K., Suman, S., & Kumari, S. (2025). *Human Centred AI for Inclusive Microfinance: A Data Driven Model for Women's Credit Empowerment and Macroeconomic Upliftment*. *Research Hub International Multidisciplinary Research Journal*.
- Beisland, L. A., Zamore, S., & Mersland, R. (2023). *Does It Pay to be Green? A Study of the Global Microfinance Industry*. *Nonprofit and Voluntary Sector Quarterly*, 52(3).
- Pandhare, A., Bellampalli, P. N., & Yadava, N. (2024). *Transforming Rural Women's Lives in India: The Impact of Microfinance and Entrepreneurship on Empowerment in Self-Help Groups*. *Journal of Innovation and Entrepreneurship*, 13(62).
- Kumarasamy, D., Singh, P., & Kaur, S. (2023). *Women Entrepreneurship, Demand Side Heterogeneity and Financial Inclusion in Rural India*. *Vision: The Journal of Business Perspective*.
- Sadraei, R., & Dal Mas, F. (2026). *Women Entrepreneurship in the Age of AI and ESG: Micro- and Macro-Level Drivers of Adoption*. *The International Journal of Entrepreneurship and Innovation*.
- Xu, J. (2024). *AI in ESG for Financial Institutions: An Industrial Survey*. *The survey explains how AI supports ESG assessment, reporting, sustainability measurement, and risk management in financial institutions*.
- Poojari, D. B., & Rathod, P. (2026). *AI-Driven Green Fintech and Sustainable Development: Empirical Evidence from India's Financial Sector*. *Phoenix: International Multidisciplinary Research Journal*.
- Andriani, L., Lal, S., & Kalam, A. A. (2022). *Entrepreneurial Activities and Women Empowerment in Rural India Between Microfinance and Social Capital*. *Strategic Change*, 31(2), 227–237.
- Arner, D. W., Barberis, J., & Buckley, R. P. (2022). *FinTech, AI and the Future of Financial Services*. *Journal of Banking Regulation*, 23(4), 245–260.
- Ghosh, S., & Vinod, D. (2023). *Artificial Intelligence and Financial Inclusion: Evidence from Emerging Economies*. *International Journal of Social Economics*, 50(7), 1021–1038.

- Kshetri, N. (2023). *Artificial Intelligence in Developing Economies: Applications for Inclusive Finance*. *IT Professional*, 25(2), 18–25.
- Sahay, R., von Allmen, U., Lahreche, A., Khera, P., Ogawa, S., Bazarbash, M., & Beaton, K. (2020). *The Promise of Fintech: Financial Inclusion in the Post-COVID Era*. IMF Working Paper.
- Gupta, A., & Jain, R. (2024). *ESG Integration and Sustainable Lending Practices in Indian Financial Institutions*. *International Journal of Sustainable Development and World Ecology*, 31(2), 145–159.
- Sharma, P., & Singh, M. (2024). *Machine Learning-Based Credit Scoring for Microfinance Institutions in India*. *International Journal of Financial Studies*, 12(1), 35–52.
- Bhattacharya, S., & Roy, P. (2023). *Digital Transformation of Microfinance Institutions: The Role of AI and Big Data Analytics*. *Journal of Financial Services Marketing*, 28(4), 356–370.
- D'Espallier, B., Guérin, I., & Mersland, R. (2021). *Women and Repayment in Microfinance: A Global Review*. *World Development*, 143, 105467.
- Mersland, R., & Strøm, R. Ø. (2022). *Microfinance Governance and Social Performance: ESG Perspectives*. *Journal of Business Ethics*, 177(2), 345–364.
- Gomber, P., Koch, J. A., & Siering, M. (2017). *Digital Finance and FinTech: Current Research and Future Research Directions*. *Journal of Business Economics*, 87(5), 537–580.
- Jagtiani, J., & Lemieux, C. (2019). *The Roles of Alternative Data and Machine Learning in Fintech Lending*. *Federal Reserve Bank of Philadelphia Working Paper*, 19-15.
- Frost, J., Gambacorta, L., Huang, Y., Shin, H. S., & Zbinden, P. (2019). *BigTech and the Changing Structure of Financial Intermediation*. *Economic Policy*, 34(100), 761–799.
- Agrawal, A., Gans, J., & Goldfarb, A. (2019). *The Economics of Artificial Intelligence: An Agenda*. University of Chicago Press.
- Zetzsche, D. A., Buckley, R. P., Arner, D. W., & Barberis, J. N. (2020). *Decentralized Finance (DeFi) and Financial Inclusion: The Promise and Challenges of FinTech*. *Journal of Financial Regulation*, 6(2), 172–203.
- Jagtiani, J., & Lemieux, C. (2019). *The Roles of Alternative Data and Machine Learning in Fintech Lending*. DOI: <https://doi.org/10.21799/frbp.wp.2019.15>
- Frost, J., Gambacorta, L., Huang, Y., Shin, H. S., & Zbinden, P. (2019). *BigTech and the Changing Structure of Financial Intermediation*. DOI: <https://doi.org/10.1093/epolic/eiaa003>
- Arner, D. W., Barberis, J., & Buckley, R. P. (2016). *The Evolution of Fintech: A New Post-Crisis Paradigm*. DOI: <https://doi.org/10.2139/ssrn.2676553>
- Gomber, P., Koch, J. A., & Siering, M. (2017). *Digital Finance and FinTech: Current Research and Future Research Directions*. DOI: <https://doi.org/10.1007/s11573-017-0852-x>
- Ozili, P. K. (2018). *Impact of Digital Finance on Financial Inclusion and Stability*. DOI: <https://doi.org/10.2139/ssrn.3149008>
- Sahay, R., et al. (2020). *The Promise of Fintech: Financial Inclusion in the Post-COVID Era*. DOI: <https://doi.org/10.5089/9781513553009.001>
- Friede, G., Busch, T., & Bassen, A. (2015). *ESG and Financial Performance: Aggregated Evidence*. DOI: <https://doi.org/10.1007/s10551-015-2889-9>
- Fatemi, A., Glaum, M., & Kaiser, S. (2018). *ESG Performance and Firm Value*. DOI: <https://doi.org/10.1007/s10551-016-3017-2>
- Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). *The Impact of Corporate Sustainability on Organizational Processes and Performance*. DOI: <https://doi.org/10.1287/mnsc.2014.1984>
- Gillan, S. L., Koch, A., & Starks, L. T. (2021). *Firms and Social Responsibility: A Review of ESG*. DOI: <https://doi.org/10.1016/j.jfineco.2021.03.010>
- Garrido-Merchán, E. C., Vaquero Lafuente, E., & Aracil, E. (2026). *AI-Powered Sustainable Finance*. DOI: <https://doi.org/10.48550/arXiv.2605.26076>
- Sadraei, R., & Dal Mas, F. (2026). *Women Entrepreneurship in the Age of AI and ESG*. DOI: <https://doi.org/10.1177/14657503251408253>
- Andriani, L., Lal, S., & Kalam, A. A. (2022). *Entrepreneurial Activities and Women Empowerment in Rural India Between Microfinance and Social Capital*. DOI: <https://doi.org/10.1002/jsc.2492>
- Kumarasamy, D., Singh, P., & Kaur, S. (2023). *Women Entrepreneurship, Demand Side Heterogeneity and Financial Inclusion in Rural India*. DOI: <https://doi.org/10.1177/09722629231204756>
- Mummidu, T. (2021). *Microfinance and Entrepreneurship: Linking Women's Motivations to Skill, Knowledge, and Capabilities*. DOI: <https://doi.org/10.1177/0972558X20975238>
- Babajide, A. A., Obembe, D., Solomon, H., & Woldesenbet, K. (2022). *Microfinance and Entrepreneurship: The Enabling Role of Social Capital Amongst Female Entrepreneurs*. DOI: <https://doi.org/10.1108/IJSE-11-2020-0745>

- Patel, P. C., Lenka, S., & Parida, V. (2022). *Caste-Based Discrimination, Microfinance Credit Scores, and Loan Approvals Among Females in India*. DOI: <https://doi.org/10.1177/0007650320982609>
- Samineni, S., & Ramesh, K. (2020). *Measuring the Impact of Microfinance on Economic Enhancement of Women*. DOI: <https://doi.org/10.1177/0972150920923108>
- D'Espallier, B., Guérin, I., & Mersland, R. (2011). *Women and Repayment in Microfinance*. DOI: <https://doi.org/10.1016/j.worlddev.2010.10.008>
- Pitt, M. M., Khandker, S. R., & Cartwright, J. (2006). *Empowering Women with Microfinance*. DOI: <https://doi.org/10.1016/j.econdev.2005.05.001>
- Beisland, L. A., Zamore, S., & Mersland, R. (2023). *Does It Pay to be Green? A Study of the Global Microfinance Industry*. DOI: <https://doi.org/10.1177/08997640221110209>
- Mersland, R., & Strøm, R. Ø. (2009). *Performance and Governance in Microfinance Institutions*. DOI: <https://doi.org/10.1016/j.jbankfin.2008.11.009>
- Hermes, N., Lensink, R., & Meesters, A. (2011). *Outreach and Efficiency of Microfinance Institutions*. DOI: <https://doi.org/10.1016/j.worlddev.2009.10.018>
- Cull, R., Demirgüç-Kunt, A., & Morduch, J. (2007). *Financial Performance and Outreach*. DOI: <https://doi.org/10.1111/j.1468-0297.2007.02017.x>
- Vanroose, A., & D'Espallier, B. (2013). *Do Microfinance Institutions Accomplish Their Mission?* DOI: <https://doi.org/10.1016/j.worlddev.2013.05.021>

# Gender Dimensions of Digital Financial Inclusion in India: Regulatory Frameworks and Global Perspectives

\*Ravi Rose  
\*\*Babita Jha

## Abstract

**Purpose :** *This paper develops a conceptual framework on Gender-Responsive Digital Financial Regulatory (GRDFR) theories and the conditions under which regulatory architectures establish gendered inequalities in digital financial inclusion (DFI). The paper interrogates the structural adequacy of existing domestic regulation in the Indian context and benchmarks it against international models of gender-responsive financial governance.*

**Design / Methodology / Approach :** *The paper adopts a conceptual methodology from secondary sources, drawing on regulatory theory, institutional economics, and gender studies. It synthesizes empirical evidence from the World Bank Global Findex Database, RBI Financial Inclusion Reports, the AFI Gender Inclusive Finance Program, and comparative country case studies (Kenya, Rwanda, Bangladesh, the Philippines, and Peru) to derive theoretical propositions and a multidimensional regulatory framework.*

**Findings :** *The paper presents four theoretical propositions. First, gender gaps in DFI are systematically reproduced across access, use, and quality when regulation is gender-neutral in design. Second, gender-neutral-to-gender-transition-transformative regulation requires institutional redesign across data governance, product standards, supervisory practice, and technology access policy. Third, India's regulatory architecture governing DFI, despite progressive policy rhetoric, remains predominantly gender-neutral, with isolated gender-sensitive elements insufficient to produce systemic change. Fourth, a global best-practice framework demonstrates that gender-responsive regulation is technically feasible and institutionally durable when embedded in supervisory mandates rather than relying on voluntary corporate actions.*

**Research Limitations / Implications :** *As a conceptual paper, the framework is not empirically tested. It is recommended to validate findings using a mixed-methods research approach that combines regulatory discourse analysis, institutional ethnography, and longitudinal data on DFI outcomes, differentiated by gender. The framework is most directly applicable to India, but it presents general propositions that can be relevant to other emerging economies in similar situations.*

**Practical Implications :** *The GRDFR Framework provides actionable guidance for financial regulators such as RBI, SEBI, IRDAI, and PFRDA, as well as fintech innovators and development finance institutions, in designing gender-responsive digital financial policies. Specific reforms have been outlined for the liberalization of KYC, the introduction of gender-disaggregated supervisory reporting, the enhancement of algorithmic fairness in credit underwriting, and the creation of regulatory sandboxes aimed at gender-specific objectives.*

**Social Implications :** *DFI can generate transformational gains in women's economic agency, household welfare, and long-term poverty reduction by closing the gender gap. The paper contends that regulatory reform is a necessary, though not sufficient, element for realizing these social goals.*

**Originality / Value :** *This paper makes an original contribution by integrating regulatory theory, gender studies, and development finance to develop the first conceptual framework specifically designed to evaluate the gender responsiveness of digital financial regulatory architectures in emerging-market contexts. It goes further than descriptive accounts of the gender gap by conceptualizing the regulatory mechanisms that produce and sustain it.*

**Keywords :** *Digital Financial Inclusion, Gender-Responsive Regulation, Fintech, India, Regulatory Framework, Algorithmic Fairness, Financial Governance, Digital Finance.*

\*Research Scholar (Ph.D.), School of Business and Management, Christ (Deemed to be University), Delhi NCR, Email: ravi.rose@res.christuniversity.in

\*\*Associate Professor, School of Business and Management, Christ (Deemed to be University), Delhi NCR

## Introduction

Digital Financial inclusion has occupied a central position in the discourse of developing and developed economies since the early 2000s. This is driven by the growing evidence that access to formal financial services, savings, credit, payments, and insurance, constitutes a critical path out of poverty (Demirgüç-Kunt et al., 2021a). The emergence of mobile telephony, biometric identity systems, and open banking infrastructure in the digital financial system (DFS) has accelerated this, creating the theoretical possibility of open access to financial intermediation at an affordable cost. India has emerged as a leading case study of this proposition for researchers and policymakers, developing the Aadhaar-based identification, mobile connectivity, and Jan Dhan accounts into a comprehensive digital public infrastructure that has enabled the formal financial inclusion of millions of citizens within a decade (Tripathi & Rajeev, 2023).

Nevertheless, comprehensive data and statistics on financial inclusion often obscure substantial disparities across demographic groups. Gender gap analysis is one of the most enduring and critical contributors to these disparities (Mader, 2018). According to The World Bank's Global Findex Database (2021), women remain systematically less likely than men to own and actively use formal financial services, including savings, accounts, credit, and insurance, in middle- and low-income countries. In the Indian context, although the gender gap in account ownership narrowed significantly from 20 percent in 2014 to around 6 percent in 2021, and women's account ownership continued to rise to 55.7% by August 2025. There are substantial disparities in account usage, digital payment adoption, access to formal credit, and the quality of financial products and services available to women.

This paper examines whether these persistent disparities are neither market failures amenable to correction through information asymmetry reduction alone nor simply reflections of pre-existing social inequalities that financial inclusion can bypass. On the contrary, they are, at least in part, structurally replicated by regulatory frameworks designed to be gender-neutral and, consequently, systematically oblivious to the gendered distribution of financial capability, social permission, and access to technology. This argument identifies regulatory design as a key causal determinant of financial inclusion outcomes, rather than a contextual variable in the production and perpetuation of the gender gap in digital financial inclusion (DFI) (Kulkarni & Ghosh, 2021).

This study contributes to ongoing scholarly discussions in four principal ways. Firstly, it integrates and extends regulatory

theory, institutional economics, and gender studies to conceptualize the connection between regulatory design and the gendered results of DFI. Secondly, it develops an original analytical framework, the Gender-Responsive Digital Financial Regulatory (GRDFR) Framework, that specifies the conditions under which regulatory systems can transition from gender-neutral to gender-transformative modes. Thirdly, this framework is utilized within India's regulatory context, highlighting distinct structural shortcomings and potential reform strategies. Fourthly, it relies on comparative international data to formulate broadly applicable theoretical propositions and to demonstrate the institutional viability of regulatory reforms responsive to gender considerations.

The paper proceeds as follows. Section 2 reviews the theoretical literature and identifies the conceptual gap that the GRDFR Framework addresses. Section 3 develops the framework and advances four theoretical propositions. Section 4 applies the framework to India, assessing the gender responsiveness of key regulatory institutions and instruments. Section 5 presents comparative international evidence. Section 6 discusses the theoretical and policy implications of the analysis. Section 7 concludes.

## Theoretical Foundations and Literature Review

### Financial Inclusion Theory and Gender Limitations

The dominant theoretical framework for financial inclusion draws on the access-to-finance literature in development economics. This idea is shaped by the groundbreaking research conducted by King and Levine (1993) and Rajan and Zingales (1998), which established the relationship between financial sector development and economic growth (Rajan & Zingales, 1996) (King & Levine, 1993). This literature, when analysed in the context of households, asserts that imperfections in financial markets, information asymmetries, transaction costs, and collateral limitations systematically exclude the marginalized population from credit markets, thereby establishing poverty traps that can be disrupted through institutional innovation (Banerjee & Duflo, 2007). Mobile money scholarship, exemplified by Suri and Jack, has extended this logic to digital channels, demonstrating that mobile financial services can generate significant welfare effects for low-income households, particularly female-headed ones (Jack & Suri, 2011).

However, this literature has been critiqued on at least two grounds relevant to this paper's gender-inclusive focus. Firstly, access-to-finance models consider exclusion chiefly a supply-

side concern to be addressed through infrastructure development, thereby underestimating the demand-side, structural, and normative factors that shape how women engage with formal financial systems (Mader, 2018). The second aspect is that the existing literature has primarily failed to address the regulatory framework as an independent variable. In the majority of financial inclusion studies, financial regulators are represented as background institutions, whose design choices are either accepted as constants or presumed to be broadly advantageous (Gabor & Brooks, 2020). This gap in regulation is particularly important for gender analysis, since the design choice in regulatory design, including KYC standards, product approval processes, consumer protection strategies, and supervisory data obligations, significantly affects the conditions of access, use, and quality that shape women's experiences in DFI (Mpofu, 2023).

### **Regulatory Theory: Regulation as an Instrument of Structural Change**

Regulatory theory provides a more comprehensive understanding of how formal rules relate to distributional effects. The literature on the regulatory state acknowledges that regulatory institutions do not serve as impartial mediators of market order. They are the ground of political struggle, where distributional decisions are embedded in seemingly technical choices regarding rule formulation and oversight practices (Moran, 2002). The legal scholars of Feminist jurisprudence have shown and developed the perspective that legal and regulatory frameworks operate in gendered ways, although seemingly neutral, and often reflect masculine norms that systematically disadvantage women, regardless of whether discrimination is intentional (MacKinnon, 1989).

This perspective, when applied to financial regulations, suggests that gender-neutral regulatory frameworks, those that apply identical rules to all market participants, regardless of their different social positions, will produce systematically unequal outcomes for males and females (Buteau et al., 2021). This is not solely a result of the pre-regulatory disadvantages women face that neutral rules do not rectify, but also due to specific regulatory design choices that deliberately perpetuate these disadvantages. Illustrations of this dynamic include KYC documentation that presupposes permanent residence, credit underwriting algorithms trained on predominantly male borrowing patterns, and consumer protection frameworks oriented toward literate smartphone users, demonstrating how ostensibly neutral regulations can embed structural biases (Basu et al., 2025). In this view, regulatory neutrality is less a condition of impartiality than a means of concealing unequal distributive consequences behind the formal language of universal rules.

### **Theoretical Perspectives on Gender-Responsive Regulation**

The framework of gender-responsive regulation has been elaborated most extensively in the literature concerning international development finance, especially through the initiatives of the Alliance for Financial Inclusion (2021) and the G20 Global Partnership for Financial Inclusion (2023) (Gibson et al., 2024a). The AFI model delineates three forms of regulatory gender engagement: gender-blind regulation, which fails to consider gender; gender-sensitive regulation, which acknowledges the constraints imposed by gender and implements focused actions to alleviate discrimination; and gender-transformative regulation, which seeks to fundamentally change the structural, normative, institutional, and economic frameworks that perpetuate gender inequality. This typology, originally developed for the health and education industry sectors (Grown et al., 2005). It has been translated into financial regulatory contexts with increasing analytical precision.

The empirical study on gender-responsive regulation remains nascent. According to Demirgüç-Kunt's 2022 study, the association between regulatory environment quality and gender gaps in financial inclusion is examined at the cross-country level, but does not disaggregate the specific regulatory mechanisms at work (Demirgüç-Kunt et al., 2021b). Klapper and Singer (2017) argue that well-designed regulation of digital payments can substantially enhance women's financial inclusion by promoting proportionate KYC requirements, ensuring interoperability across mobile money services, and expanding the diversity and reach of agent networks (Klapper & Singer, 2017). This paper aims to address that deficiency by advancing a gender-responsive regulatory framework that complements Ozili's conceptual architecture in the year 2020 of sustainable financial inclusion and highlights the role of regulatory design in shaping gendered financial outcomes (Ozili, 2020).

### **The GRDFR Framework and Theoretical Propositions**

#### **Proposed Analytical Gender-Responsive Regulatory Framework**

The Gender-Responsive Digital Financial Regulatory (GRDFR) Framework is organized around three analytical axes and four regulatory pillars, as shown in Figure 1. The three analytical axes correspond to the AFI dimensions of financial inclusion access, usage, and quality, adapted to the digital context. The four regulatory pillars represent the institutional domains where gender-responsive reform is required: (i) Data Governance and Supervisory Intelligence; (ii) Market Entry and Product Standards; (iii) Technology Access Infrastructure; and (iv) Consumer Protection and Redress.

Regulatory Pillar	Access Dimension	Usage & Quality Dimension
<b>Data Governance</b>	<ul style="list-style-type: none"> <li>i. Sex-disaggregated account data.</li> <li>ii. Gender Gap Indices in Regulatory Reporting</li> </ul>	<ul style="list-style-type: none"> <li>I. Gender-disaggregated usage data.</li> <li>ii. Product quality audit by gender segment</li> </ul>
<b>Market Entry &amp; Product Standards</b>	<ul style="list-style-type: none"> <li>i. Tiered/proportionate KYC.</li> <li>ii. Documentation flexibility for women</li> </ul>	<ul style="list-style-type: none"> <li>i. Gender-appropriate product suitability standards.</li> <li>ii. Anti-algorithmic-discrimination rules</li> </ul>
<b>Technology Access Infrastructure</b>	<ul style="list-style-type: none"> <li>i. Non-smartphone channel mandates.</li> <li>ii. Female BC network targets</li> </ul>	<ul style="list-style-type: none"> <li>i. Digital literacy standards.</li> <li>ii. USSD/IVR payment channel requirements</li> </ul>
<b>Consumer Protection &amp; Redress</b>	<ul style="list-style-type: none"> <li>i. Multi-channel grievance mechanisms.</li> <li>ii. Voice-based complaint access</li> </ul>	<ul style="list-style-type: none"> <li>i. Gender-sensitive financial education.</li> <li>ii. Prohibition of gender-correlated pricing disparities</li> </ul>

The framework operates across three regulatory regime types, gender-blind, gender-sensitive, and gender-transformative, corresponding to escalating levels of institutional commitment to gender equity. A gender-blind regime applies identical rules to all participants; a gender-sensitive regime introduces targeted measures, such as women-specific credit programs,

without altering the underlying regulatory architectural framework; a gender-transformative regime embeds gender equity as a core supervisory objective, requiring institutional redesign across all four pillars. The framework generates four theoretical propositions.

#### Theoretical Propositions

##### Proposition 1

Gender gaps in digital financial inclusion are structurally reproduced when regulatory systems are gender-blind across all four pillars of the GRDFR Framework. The absence of sex-disaggregated supervisory data, combined with gender-neutral product standards and technology access requirements, creates self-reinforcing dynamics of exclusion that persist even as aggregate financial inclusion metrics improve.

##### Proposition 2

The transition from gender-blind to gender-sensitive regulation reduces access gaps but does not deconstruct the structural mechanisms that produce them. Women-targeted programs, operating within an otherwise gender-blind regulatory system, produce incremental gains in account ownership without generating the usage and deepening quality necessary for substantive financial empowerment.

##### Proposition 3

Gender-transformative regulations need institutional redesign at the level of supervisory mandate, rather than supervisory preference. Where gender equity is embedded as a legally specified objective of regulatory agencies, with attendant data collection requirements and accountability mechanisms, gender-responsive outcomes are more likely to be durable and system-wide rather than episodic and program-specific.

##### Proposition 4

The financial systems that utilize digital mediation and algorithmic governance introduce a novel structural form of gender exclusion. This exclusion is the one that current consumer protection frameworks, created for traditional analogue financial products, are not institutionally prepared to address. Gender-transformative regulation of digital finance, therefore, requires a dedicated algorithmic accountability pillar that mandates gender impact assessments of credit-scoring, risk-profiling, and product-recommendation algorithms.

These propositions lead to a set of empirical predictions that can be examined through comparative regulatory analysis. Countries with gender-transformative regulatory frameworks, as indicated by the existence of gender-specific supervisory mandates, obligatory sex-disaggregated reporting, and targets for female agent networks (Peter et al., 2025). This is expected to exhibit consistently smaller gender gaps in the usage and quality of DFI, while controlling for factors such as economic development, mobile penetration, and social norm indicators (Kulkarni & Ghosh, 2021). This hypothesis is consistent with existing evidence from Rwanda and the Philippines, which is discussed in Section 5 of this paper.

## Applying the GRDFR Framework to India

### Pillar I - Data Governance: - The Disaggregation Deficit

The first pillar of the GRDFR Framework, data governance and supervisory intelligence, reveals a fundamental structural gap in India's regulatory system. A significant limitation of the current data in the digital ecosystem is that the RBI Financial Inclusion Index, SEBI investor surveys, IRDAI market reports, and PFRDA pension statistics consistently lack sufficiently granular, sex-disaggregated data, thereby constraining efforts to identify gender-specific exclusion patterns and to assess the differential effects of regulatory policies on women. The systematic absence of gender-stratified information within the supervisory intelligence infrastructure is referred to as a disaggregation deficit.

The disaggregation deficit has profound consequences for regulatory design. Without data on the gender composition of loan portfolios, insurance premium bases, or payment transaction volumes, regulators cannot identify where and how gender gaps emerge. This gap holds financial institutions accountable for gender-discriminatory market practices, thereby enabling evaluation of the effectiveness of targeted interventions such as PMJDY or Sukanya Samridhi Yojana. The result is a regulatory feedback loop that is systematically blind to gender. The policy is designed without gender-specific objectives, and implementation proceeds without gender-disaggregated monitoring. The outcomes are evaluated using aggregate metrics that mask gendered heterogeneity, and regulatory learning does not incorporate gender-specific insights.

According to Proposition 1, this disaggregation gap is essential for the ongoing formation of gender gaps in DFI. Even if specific regulatory programs like PMJDY, UPI 123Pay, and self-help group credit schemes generate pockets of gender-sensitive support, their overall systemic influence remains limited without a

regulatory data infrastructure to monitor, assign, and enhance their impact.

### Pillar II - Product Standards: - KYC, Credit, and Algorithmic Risk

India's Know Your Customer (KYC) framework, which sets the rules for identity verification in opening financial accounts, illustrates the gender-neutral product standard issue highlighted in the GRDFR Framework. Although measures such as the RBI's Small Accounts rule and Aadhaar-based eKYC have reduced documentation hurdles for marginalized groups, the framework lacks specific consideration of the unequal documentation burdens women face. Women, especially in rural and semi-urban regions, are less likely to have their own identity documents and are more often recorded at addresses under male household members, reflecting patriarchal norms surrounding property and domicile registration. The KYC framework's underlying assumption of individual documentary identity, therefore, incorporates a masculine norm that can disadvantage women without explicit discrimination.

The GRDFR Framework in credit markets highlights the rise of algorithmic credit underwriting as a new form of gender bias, as shown in Proposition 4. Fintech lenders increasingly rely on machine learning models that use alternative data sources, such as mobile usage, e-commerce records, and psychometric evaluations, to assess creditworthiness. These models are trained on past data that mirror current economic participation, which is influenced by gender inequality (Jhamb, 2025). Women who spend less time on digital platforms, have limited purchase histories, or reside in mostly female-headed households may be systematically underserved, a phenomenon known as 'digital redlining' (Noble, 2018). Currently, India's regulatory environment lacks provisions for algorithmic accountability in credit scoring, revealing a significant gap: traditional banking regulations do not address it, and existing supervisory tools are also outside its scope.

### Pillar III - Technology Access: - The Smartphone Dependency Problem

The technology access pillar of the GRDFR Framework assesses the infrastructure conditions that enable women with varying levels of device capabilities and digital literacy to access digital financial services (Mishra et al., 2024). Although India's UPI system can technically support non-smartphone access via UPI 123Pay and USSD channels, it was primarily designed and promoted as a service reliant on smartphones. With a gender gap in smartphone ownership estimated at 15% by GSMA (2023), this disparity directly results in a gender gap in accessing the full spectrum of UPI-enabled financial services.

The technology access gap is exacerbated by the gender divide in digital literacy. Several national surveys show that women, especially in rural areas, have much less confidence and skills in using digital financial tools. This stems from lower levels of education and less experience with digital technology. These literacy differences, combined with product design issues, lead to additional exclusion. Even women with smartphones and active accounts often cannot navigate digital financial apps without help. This reliance on male household members reduces women's independence and limits the empowering potential of digital finance (Peter et al., 2025).

#### **Pillar IV - Consumer Protection: - Grievance Redressal and Norm-Embedded Risks**

India's consumer protection frameworks, including the RBI Integrated Ombudsman, SEBI's investor protection measures, IRDAI's Insurance Ombudsman, and the new DPDPA 2023, are primarily designed for consumers who are literate, digitally skilled, and able to file complaints independently. These assumptions are less applicable to low-income women, who often face literacy barriers, depend on intermediaries such as banking correspondents or relatives who may not always advocate for their best interests, and are influenced by social norms that discourage them from openly asserting their financial rights (Gibson et al., 2024b).

The DPDPA 2023's consent-based system for personal data processing introduces a new aspect of gender-related consumer protection. Although the Act's consent rules aim to prevent data misuse, its reliance on digital consent interfaces assumes literacy and device access, which many women lack. This situation risks excluding them from the benefits of the data economy while exposing them to its risks through informal data flows. The Act does not include specific gender provisions or require gender impact assessments of data systems gaps highlighted by the GRDFR Framework as essential for a gender-transformative regulatory approach.

### **Comparative International Evidence: - Gender-Transformative Regulatory Models**

#### **Rwanda: - Embedding Gender in Supervisory Architecture**

Rwanda's National Bank is the most advanced example of gender-transformative financial regulation among developing countries. The National Bank of Rwanda's Financial Sector Development Program III explicitly incorporates gender equity as a core regulatory objective and requires all licensed financial institutions to submit gender-disaggregated data on deposits, loans, insurance uptake, and customer service metrics as part of

standard supervisory returns. This institutional design choice, which embeds gender-disaggregated reporting in supervisory compliance rather than voluntary disclosure, directly addresses the disaggregation deficit identified in Pillar I of the GRDFR Framework.

Rwanda's experience supports Proposition 3: when gender equity is established as a legal supervisory goal, supported by data and accountability measures, gender-responsive results tend to last longer than those from targeted programs alone. Data from Rwanda's FinScope surveys indicate a significant reduction in gender gaps in formal financial inclusion during the FSDP III period. This progress is partly due to regulatory demands on financial institutions to create and promote products suited for women, with gender-disaggregated data facilitating this pressure.

#### **Kenya and Bangladesh: - Technology and Institutional Innovation**

Kenya's M-Pesa ecosystem offers a distinct model of gender-responsive outcomes, achieved not through deliberate regulatory design but through technology architecture and market incentives that coincidentally aligned with women's financial needs. M-Pesa's agent-based distribution model, accessible on basic mobile handsets without requiring a smartphone, addressed the technology access barrier identified in GRDFR Pillar III before it was formally conceptualized in regulatory terms. (Jack & Suri, 2011) Long-run evidence documented by Suri and Jack (2016) shows a 22 percent reduction in poverty for female-headed households, demonstrating that appropriate technology architecture can produce transformational gender outcomes even in the absence of an explicit regulatory mandate.

However, Kenya's experience also illustrates the limits of market-driven gender inclusion. As the financial services ecosystem has grown more complex, incorporating digital credit, investment products, and insurance alongside basic payments, the technology-access advantage of early M-Pesa has eroded as smartphone-dependent services proliferate. Regulatory responses have lagged the market's evolution, suggesting that technology-driven gender inclusion is sustainable only when accompanied by proactive, gender-responsive regulatory oversight.

Bangladesh's microfinance regulatory architecture offers a third model, in which gender is embedded not in the central bank's supervisory framework but in the licensing and operational requirements for a specialized class of financial intermediaries, microfinance institutions explicitly mandated to serve women

borrowers. The Microcredit Regulatory Authority's requirement that MFIs maintain gender-disaggregated loan portfolios and report on women's empowerment outcomes constitutes delegated gender-responsive regulation that has produced measurable improvements in women's credit access and financial agency, while concentrating risk in a sector subject to ongoing debate about debt burden and over-indebtedness.

### **The Philippines and Indonesia: - National Strategy Integration**

The Philippines' Bangko Sentral ng Pilipinas offers the most comprehensive model for integrating gender into a national financial inclusion strategy. BSP's National Financial Inclusion Strategy 2022–2028 explicitly designates women as a priority target population, alongside farmers and micro-entrepreneurs, and has introduced gender-disaggregated metrics into its National Baseline Survey on Financial Inclusion. Critically, BSP has used its regulatory sandbox framework to test gender-specific fintech products, including AI-powered credit scoring calibrated for women micro-entrepreneurs with limited formal credit histories, thereby directly addressing the algorithmic accountability gap identified in GRDFR Proposition 4.

Indonesia's Otoritas Jasa Keuangan (OJK) has operationalized gender-responsive regulation through its annual Financial Literacy and Inclusion Survey (SNLIK), which produces gender-disaggregated indices that inform regulatory decisions and institutional targets (Prihandini, 2025). OJK's requirement that financial service institutions submit gender-disaggregated customer data alongside other supervisory metrics parallels Rwanda's approach, though implementation has been less comprehensive. These cases collectively suggest that gender-transformative regulation is not a luxury of high-income regulatory systems but is institutionally achievable across a range of emerging-market regulatory contexts.

## **Discussion: - Implications and Propositions in Context**

### **Theoretical Implications**

The GRDFR Framework advances financial regulation theory in two ways. First, it offers an analytical vocabulary for classifying regulatory regimes by their gender responsiveness, moving beyond the binary of 'inclusive' versus 'exclusive' regulation toward a multidimensional assessment of regulatory gender-blindness across four specific pillars. This vocabulary enables comparative regulatory analysis that is both theoretically grounded and empirically tractable, linking to the comparative institutionalism literature in political economy (Hall, 2001) by treating regulatory design as a structured variable with theoretically predictable distributional effects.

Second, the framework's Proposition 4 extends existing theories of financial exclusion into the domain of machine learning governance. The emerging literature on algorithmic fairness (Vaswani et al., 2017) has developed primarily within computer science and data ethics, with limited ties to financial regulation theory. The GRDFR Framework provides a conceptual bridge, positioning algorithmic gender bias as a regulatory phenomenon that requires institutional responses, including explainability, gender impact assessment of credit models, and gender-disaggregated model performance reporting, rather than merely a technical problem solvable through engineering refinement.

### **Policy Implications for India**

For India specifically, the GRDFR Framework identifies five priority reform areas. First, the RBI should mandate that all supervised financial institutions collect and publish gender-disaggregated data and restructure the Financial Inclusion Index to include a gender sub-index (Ghosh & Hom Chaudhury, 2022). Second, the KYC framework should be reformed to introduce a proportionate, tiered approach that allows women to access basic payment accounts using community-verified identity documentation when individual documentary proof is unavailable. Third, the RBI and NPCI should mandate that all payment system participants support non-smartphone access channels, with performance targets for UPI 123Pay adoption in rural and semi-urban areas. Fourth, the RBI and SEBI should develop an algorithmic accountability framework for consumer financial products, requiring a gender impact assessment of AI-driven credit, insurance, and investment recommendation systems as a condition of regulatory approval. Fifth, the RBI's regulatory sandbox framework should include a dedicated, gender-responsive fintech cohort with mandatory consumer welfare metrics (Gupta et al., 2025).

These reforms are not individually complex; several have direct counterparts in existing international regulatory models. Their implementation requires a commitment to gender equity, treating it as a core rather than a peripheral objective of financial market regulation. This is, in essence, a governance choice rather than a technical one: it requires senior regulatory leadership to formally incorporate gender into strategic planning documents, supervisory inspection frameworks, and enforcement priorities.

### **Limitations of the Conceptual Analysis**

This paper's conceptual methodology has inherent limitations. The GRDFR Framework's four propositions are theoretically derived rather than empirically validated; they are informed hypotheses about causal mechanisms rather than established

findings. The comparative case evidence marshalled in support of the framework is selective and cannot substitute for systematic cross-country empirical analysis. The framework's application to India draws on secondary data sources whose gender-disaggregated content is itself limited by a circularity that reflects the disaggregation deficit the framework diagnoses. Future research should address these limitations through mixed-methods empirical investigation, including regulatory discourse analysis of institutional documents from RBI, SEBI, IRDAI, and PFRDA; qualitative interviews with regulators, financial institutions, and women consumers; and quantitative analysis of gender-disaggregated DFI outcomes using household panel data.

## Conclusion

This paper has argued that persistent gender gaps in digital financial inclusion in India are not merely the residue of pre-regulatory social inequalities but are structurally reproduced by a regulatory architecture that remains substantially gender-blind across the four pillars of data governance, product standards, technology access, and consumer protection. Drawing on regulatory theory, institutional economics, and gender studies, the paper has developed the GRDFR Framework, a conceptual tool for diagnosing the gender responsiveness of digital financial regulatory regimes and identifying pathways toward gender-transformative reform.

The framework's four theoretical propositions converge on a central claim: that gender-transformative regulation requires institutional redesign at the supervisory mandate level, not merely supervisory preference. This distinction between legal obligation and regulatory goodwill is consequential because it determines whether gender equity is a stable objective or a discretionary priority, susceptible to displacement by competing regulatory agendas during periods of financial instability, political transition, or institutional resource constraints.

International comparative evidence from Rwanda, Kenya, Bangladesh, the Philippines, and Indonesia demonstrates that gender-transformative regulation is institutionally achievable across diverse regulatory contexts and levels of economic development. The common institutional thread in the most successful cases, mandatory gender-disaggregated supervisory data, gender equity embedded in formal regulatory mandates, and technology access standards calibrated for non-smartphone users, provides a clear blueprint for India's regulatory reform agenda.

India has built the world's most ambitious digital financial infrastructure. The next phase of that project, making the

infrastructure substantively accessible and beneficial to women as autonomous economic agents, requires regulatory ambition of comparable scale. The GRDFR Framework offers a conceptual foundation for that ambition: it makes the invisible visible by naming the regulatory choices that produce gendered exclusion and by theorizing the institutional conditions under which those choices can be reversed. The digital financial revolution will not empower women by default. It must be consciously, institutionally, and regulatory-wise designed to do so (Dey, 2025).

## References

- Banerjee, A. V., & Duflo, E. (2007). *The economic lives of the poor*. *Journal of Economic Perspectives*, 21(1), 141–167.
- Basu, A., Sengupta, S., Ghosh, S., Kar, M., & Guchhait, S. K. (2025). *Gender Gap in Digital Financial Services: In Search of Financial Inclusivity in Indian Sundarban*. *Asian Journal of Economics, Business and Accounting*, 25(11), 191–201.
- Buteau, S., Rao, P., & Valenti, F. (2021). *Emerging insights from digital solutions in financial inclusion*. *CSI Transactions on ICT*, 9(2), 105–114.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2021a). *Financial inclusion, digital payments, and resilience in the age of COVID-19*. *World Bank Report*.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2021b). *Financial inclusion, digital payments, and resilience in the age of COVID-19*. *World Bank Report*.
- Dey, A. (2025). *Gender Equality in the Digital Age: Exploring Women's Empowerment, Digital Entrepreneurship, and Financial Inclusion in Emerging Markets*. *RESEARCH HUB International Multidisciplinary Research Journal*, 12(6), 55–62.
- Gabor, D., & Brooks, S. (2020). *The digital revolution in financial inclusion: International development in the fintech era*. In *Material cultures of financialisation* (pp. 69–82). Routledge.
- Ghosh, C., & Hom Chaudhury, R. (2022). *Determinants of digital finance in India*. *Innovation and Development*, 12(3), 343–362.
- Gibson, E., Gazi, S., & Arner, D. W. (2024a). *Digital finance, financial inclusion and gender equality: Digital public goods, rearchitecting financial systems and economic empowerment of women*.
- Gibson, E., Gazi, S., & Arner, D. W. (2024b). *Digital finance, financial inclusion and gender equality: Digital public goods, rearchitecting financial systems and economic empowerment of women*.

- Grown, C., Gupta, G. R., Kes, A., & Millénaire, P. O. du. (2005). *Taking action: Achieving gender equality and empowering women*. Earthscan London.
- Gupta, S. K., Ojha, M., & Dhamija, G. (2025). *Banking on Connectivity: Internet Exposure and Women's Financial Autonomy*. GLO Discussion Paper.
- Hall, P. A. (2001). David Soskice, eds. 2001. *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*, 1.
- Jack, W., & Suri, T. (2011). *Mobile money: The economics of M-PESA*. National Bureau of Economic Research.
- King, R. G., & Levine, R. (1993). *Finance and growth: Schumpeter might be right*. *The Quarterly Journal of Economics*, 108(3), 717–737.
- Klapper, L., & Singer, D. (2017). *The opportunities and challenges of digitizing government-to-person payments*. *The World Bank Research Observer*, 32(2), 211–226.
- Kulkarni, L., & Ghosh, A. (2021). *Gender disparity in the digitalization of financial services: Challenges and promises for women's financial inclusion in India*. *Gender, Technology and Development*, 25(2), 233–250.
- MacKinnon, C. A. (1989). *Toward a feminist theory of the state*. Harvard University Press.
- Mader, P. (2018). *Contesting financial inclusion*. *Development and Change*, 49(2), 461–483.
- Mishra, D., Agarwal, N., Sharahiley, S., & Kandpal, V. (2024). *Digital financial literacy and its impact on financial decision-making of women: Evidence from India*. *Journal of Risk and Financial Management*, 17(10), 468.
- Mpofu, F. Y. (2023). *Gender disparity and digital financial inclusion in advancing the attainment of sustainable development goals in developing countries*. *International Journal of Innovation in Management, Economics and Social Sciences*, 3(3), 49–70.
- Ozili, P. K. (2020). *Theories of financial inclusion*.
- Peter, S., Elangovan, G., & Gupta, A. (2025). *Digital engagement in financial inclusion for bridging the gendered entrepreneurial financial gap: Evidence from India*. *Cogent Business & Management*, 12(1), 2518492.
- Prihandini, W. (2025). *Digital financial literacy and financial inclusion in Indonesia's digital economy*. *International Journal of Economics, Business and Accounting Research (IJEBAR)*, 9(3).
- Rajan, R., & Zingales, L. (1996). *Financial Dependence and Growth (No. W5758; p. w5758)*. National Bureau of Economic Research. <https://doi.org/10.3386/w5758>
- Tripathi, S., & Rajeev, M. (2023). *Gender-inclusive development through fintech: Studying gender-based digital financial inclusion in a cross-country setting*. *Sustainability*, 15(13), 10253.
- Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, Ł., & Polosukhin, I. (2017). *Proceedings of the 31st Conference on Neural Information Processing Systems*.

# AI-Driven Advertising and the Transformation of Consumer Decision-Making: A Bibliometric and Empirical Investigation

\*Saurabh Gupta  
\*\*Vinitendra Pratap Singh

## Abstract

*The rapid proliferation of Artificial Intelligence (AI) within contemporary advertising ecosystems has fundamentally redefined the dynamics of consumer engagement, information processing, and decision-making behaviour in digitally mediated marketplaces. AI-driven advertising, characterized by predictive analytics, algorithmic targeting, and personalized communication mechanisms, has emerged as a transformative force influencing consumer cognition and behavioural responses. Against this backdrop, the present study seeks to examine the evolving intellectual structure of AI-driven advertising research and investigate its implications for consumer decision-making in the digital era. The study adopts a dual methodological framework integrating bibliometric analysis and empirical investigation. The bibliometric component, based on data extracted from the Dimensions database, aims to identify dominant research themes, influential scholarly contributions, publication trends, and emerging conceptual trajectories within the domain of AI-driven advertising and consumer decision-making. Subsequently, the empirical investigation examines the behavioural influence of AI-driven advertising on digitally active consumers. Primary data will be collected through a structured questionnaire and analyzed using Structural Equation Modeling (SEM) through AMOS software to examine the proposed relationships among the study constructs.*

*The study is expected to contribute to the expanding discourse on AI-enabled marketing by offering both intellectual mapping and empirical insights into the transformational role of AI in shaping contemporary consumer decision-making behaviour. The findings may provide strategic implications for marketers, policymakers, and business organizations seeking to develop ethically responsible, consumer-centric, and technologically adaptive advertising strategies within rapidly evolving digital environments.*

**Keywords:** Artificial Intelligence, AI-Driven Advertising, Consumer Decision-Making, Digital Marketing, Consumer Behaviour

## 1. Introduction

The unprecedented advancement of Artificial Intelligence (AI) has profoundly reconfigured the architecture of contemporary marketing and advertising ecosystems, ushering in a paradigm shift from conventional mass communication toward intelligent, predictive, and hyper-personalized consumer engagement mechanisms. In the rapidly evolving digital economy, AI-driven advertising has emerged as a transformative strategic instrument enabling organizations to leverage machine learning algorithms, predictive analytics, natural language processing, and automated recommendation systems to influence consumer cognition, perception, and purchase-

related decision-making with remarkable precision and scalability.

The integration of AI within advertising practices has substantially altered the dynamics of consumer-brand interaction by facilitating real-time personalization, behavioural targeting, algorithmic content optimization, and data-driven communication strategies. Contemporary consumers operate within digitally mediated environments characterized by continuous exposure to AI-curated advertisements across social media platforms, e-commerce ecosystems, search engines, and

\*Assistant Professor, School of Management, BBD University Lucknow Email ID: saurabh22sep1985@bbdu.ac.in  
\*\* Professor, School of Management. BBD University Lucknow

interactive digital interfaces. Consequently, consumer decision-making is no longer exclusively shaped by rational evaluation processes but is increasingly mediated through algorithmic intelligence capable of anticipating behavioural tendencies, emotional responses, and consumption preferences.

From a managerial perspective, AI-driven advertising offers substantial strategic advantages including enhanced consumer engagement, operational efficiency, market responsiveness, and optimized advertising effectiveness. Organizations increasingly rely upon AI-enabled systems to decode complex consumer data patterns, predict purchasing intentions, and deliver individualized advertising experiences designed to maximize conversion rates and customer retention. Such developments have significantly expanded the role of intelligent advertising technologies in reshaping contemporary consumer behaviour and redefining competitive dynamics within digital marketplaces.

Nevertheless, the rapid proliferation of AI-enabled advertising practices has simultaneously generated significant academic, ethical, and societal concerns. The increasing dependence upon algorithmic persuasion mechanisms raises critical questions regarding consumer autonomy, behavioural manipulation, data privacy, psychological influence, transparency, and ethical accountability in digital advertising environments. The growing sophistication of AI-generated advertising content has intensified scholarly interest in examining how technologically mediated promotional strategies influence consumer judgement, purchasing behaviour, and decision-making processes within increasingly data-centric commercial ecosystems. In recent years, scholarly discourse surrounding AI-driven advertising and consumer decision-making has witnessed substantial growth across multidisciplinary domains including marketing, information systems, behavioural sciences, digital business, and strategic management. Despite the expanding body of literature, the intellectual structure, thematic evolution, and emerging research trajectories associated with AI-driven advertising remain conceptually fragmented and methodologically dispersed. Furthermore, empirical investigations examining the behavioural implications of AI-enabled advertising mechanisms within digitally active consumer populations remain relatively limited, thereby necessitating deeper scholarly exploration.

Against this intellectual backdrop, the present study seeks to address these research gaps through a dual methodological framework integrating bibliometric analysis and empirical investigation. The bibliometric component aims to systematically map the intellectual landscape of AI-driven advertising research by identifying dominant publication

trends, influential scholarly contributions, collaborative networks, and emerging thematic clusters using data extracted from the Dimensions database. Simultaneously, the empirical component investigates the influence of AI-driven advertising on consumer decision-making behaviour through Structural Equation Modeling (SEM) utilizing AMOS software. The study is expected to make meaningful theoretical and managerial contributions by advancing the contemporary understanding of AI-enabled advertising ecosystems and their transformative influence on consumer decision-making in the digital era. The findings may provide strategic insights for marketers, policymakers, and business organizations seeking to develop ethically responsible, consumer-centric, and technologically adaptive advertising strategies aligned with the evolving dynamics of AI-driven digital marketplaces.

## **2. Literature Review**

### **2.1 Artificial Intelligence in Contemporary Advertising**

The accelerated proliferation of Artificial Intelligence (AI) has profoundly redefined the strategic architecture of contemporary advertising ecosystems, facilitating a paradigmatic transition from conventional mass communication models toward predictive, intelligent, and hyper-personalized consumer engagement mechanisms (Huang & Rust, 2021; Davenport et al., 2020; Dwivedi et al., 2021). The integration of machine learning, predictive analytics, natural language processing, recommendation algorithms, and automated decision-support systems has substantially enhanced advertising precision, behavioural targeting capabilities, and consumer interaction efficiency within digitally mediated marketplaces (Haenlein & Kaplan, 2019; Jarek & Mazurek, 2019; Kietzmann et al., 2018). Existing scholarly discourse increasingly conceptualizes AI-driven advertising as a transformative strategic capability capable of reshaping organizational communication frameworks and consumer-brand interaction dynamics (Libai et al., 2020; Puntoni et al., 2021). Research undertaken by Grewal et al. (2021), Verma et al. (2021), and Chintalapati and Pandey (2022) demonstrated that AI-enabled advertising systems significantly enhance personalization accuracy, digital responsiveness, consumer engagement, and advertising effectiveness through real-time behavioural analytics and predictive communication mechanisms. Similarly, Lemon and Verhoef (2016) argued that digitally integrated consumer experiences increasingly rely upon AI-enabled interaction systems capable of influencing consumer perception and behavioural intention within online marketplaces.

The growing diffusion of AI-powered advertising technologies across social media platforms, e-commerce ecosystems, and

digital communication infrastructures has further intensified academic interest in algorithmic consumer influence and technologically mediated engagement systems (Bleier & Eisenbeiss, 2015; De Bruyn et al., 2020; Kumar et al., 2023). Contemporary organizations increasingly utilize AI-driven advertising systems to decode behavioural tendencies, anticipate purchasing intentions, and optimize consumer interaction through automated promotional customization and intelligent recommendation architectures (Rust & Huang, 2021; Davenport et al., 2020). Consequently, AI-driven advertising has emerged as one of the most strategically consequential dimensions of modern digital marketing practice and consumer behavioural transformation.

## **2.2 AI-Driven Advertising and Consumer Decision-Making**

Consumer decision-making has historically been interpreted through rational and information-processing paradigms emphasizing need recognition, alternative evaluation, purchase intention, and post-purchase behavioural assessment (Kotler & Keller, 2016). However, the rapid expansion of AI-enabled advertising technologies has substantially transformed the behavioural architecture of contemporary consumer decision-making by embedding predictive and algorithmically curated communication systems within digitally connected environments (Ameen et al., 2021; Dwivedi et al., 2021).

Existing literature demonstrates that AI-driven advertising significantly influences consumer cognition, emotional response mechanisms, online engagement patterns, and purchasing behaviour through personalized promotional exposure and predictive recommendation systems (Puntoni et al., 2021; Grewal et al., 2021; Libai et al., 2020). Personalized advertising infrastructures increasingly utilize browsing histories, demographic profiling, behavioural analytics, and real-time digital interaction data to generate highly individualized communication experiences designed to maximize consumer responsiveness and purchasing probability (Bleier & Eisenbeiss, 2015; Verma et al., 2021). Research conducted by Huang and Rust (2023), De Bruyn et al. (2020), and Haenlein and Kaplan (2019) suggested that AI-enabled advertising mechanisms possess substantial capability to shape consumer perception, digital trust formation, and online purchasing intention through algorithmic behavioural prediction and intelligent communication adaptation. Furthermore, studies undertaken by Voorveld et al. (2018), Lemon and Verhoef (2016), and Chintalapati and Pandey (2022) indicated that technologically personalized advertising environments contribute toward enhanced consumer engagement, emotional attachment, and digitally mediated consumption behaviour. Such developments signify the increasing transformation of consumer decision-making from

rational evaluation processes toward algorithmically influenced behavioural ecosystems.

## **2.3 Personalized Advertising and Digital Consumer Behaviour**

The proliferation of AI-powered personalization technologies has substantially intensified the behavioural influence of digital advertising systems within contemporary consumer environments. Personalized advertising refers to the strategic utilization of behavioural insights, predictive analytics, and consumer-specific data architectures to deliver individualized promotional communication aligned with consumer preferences, interaction histories, and purchasing tendencies (De Bruyn et al., 2020; Voorveld et al., 2018).

Existing investigations suggest that AI-enabled personalization significantly enhances perceived advertising relevance, digital consumer experience, purchasing intention, and online interaction effectiveness (Grewal et al., 2021; Lemon & Verhoef, 2016). Recommendation systems embedded within contemporary digital platforms increasingly shape consumer attention allocation and behavioural response mechanisms through algorithmically optimized communication architectures and predictive targeting systems (Kietzmann et al., 2018; Libai et al., 2020). Similarly, Kumar et al. (2023), Verma et al. (2021), and Chintalapati and Pandey (2022) argued that AI-driven personalization contributes toward stronger consumer-brand relationships through adaptive communication frameworks and continuous behavioural customization. Nevertheless, the increasing sophistication of algorithmic personalization mechanisms has simultaneously generated substantial concerns regarding compulsive digital engagement, impulsive purchasing tendencies, behavioural dependency, and diminished consumer autonomy within technologically mediated marketplaces (Martin & Murphy, 2017; Zuboff, 2019). Scholars including Cath et al. (2018), Floridi et al. (2018), and Rai (2020) contended that AI-enabled advertising systems possess persuasive capacities capable of subtly manipulating consumer judgement and behavioural responses through technologically embedded influence mechanisms. Consequently, personalized advertising continues to occupy a central position within contemporary scholarly discourse surrounding digital consumer behaviour and technologically mediated persuasion systems.

## **2.4 Ethical Concerns in AI-Driven Advertising**

Despite its strategic and operational advantages, AI-driven advertising has generated substantial ethical concerns associated with behavioural surveillance, algorithmic opacity, consumer manipulation, and digital privacy intrusion (Zuboff, 2019; Floridi et al., 2018). Contemporary AI-enabled advertising ecosystems increasingly rely upon extensive consumer data extraction, predictive behavioural analytics, and automated

profiling systems to optimize promotional communication and advertising effectiveness (Martin & Murphy, 2017; Cath et al., 2018).

Existing investigations suggest that algorithmic advertising infrastructures possess significant capability to influence consumer cognition, behavioural intention, and purchasing decisions beyond traditional persuasive communication mechanisms (Mikalef et al., 2022; Rai, 2020). Furthermore, scholars have emphasized that opaque algorithmic systems frequently limit consumer awareness regarding data utilization practices, behavioural tracking mechanisms, and automated advertising optimization processes, thereby intensifying concerns relating to transparency, accountability, and ethical responsibility within digitally mediated advertising ecosystems (Dwivedi et al., 2021; Huang & Rust, 2021). The increasing sophistication of AI-generated promotional environments has therefore intensified scholarly and managerial debates concerning ethical AI governance, responsible personalization, and consumer-centric digital communication frameworks (Puntoni et al., 2021; Grewal et al., 2021). Consequently, the development of ethically responsible AI-driven advertising systems has emerged as a critical strategic imperative within contemporary digital marketing discourse.

### 3. Research Gap

Although existing literature has extensively explored Artificial Intelligence, digital marketing, and consumer behaviour, limited studies have comprehensively integrated these dimensions within the context of AI-driven advertising and consumer decision-making. Prior investigations have predominantly emphasized technological efficiency, personalization effectiveness, and advertising performance, while comparatively limited scholarly attention has been devoted toward examining the broader behavioural implications of AI-enabled advertising systems (Dwivedi et al., 2021; Huang & Rust, 2021). Furthermore, the intellectual structure and thematic evolution associated with AI-driven advertising research remain fragmented across multidisciplinary academic domains. Limited investigations have combined bibliometric mapping with empirical behavioural analysis to provide integrated intellectual and managerial insights into AI-enabled advertising ecosystems.

Additionally, empirical evidence examining the influence of AI-driven advertising on consumer decision-making behaviour among digitally active consumers remains comparatively underexplored, particularly within rapidly expanding digital marketplaces. Against this backdrop, the present study seeks to

address these conceptual and empirical gaps through a dual methodological framework integrating bibliometric analysis and empirical investigation utilizing Structural Equation Modeling (SEM) through AMOS software.

### 4. Research Objectives

The present study seeks to examine the transformational influence of AI-driven advertising on contemporary consumer decision-making behaviour within digitally mediated marketplaces. In alignment with the bibliometric and empirical orientation of the study, the following research objectives have been formulated:

1. To examine the intellectual structure, publication trends, and thematic evolution associated with AI-driven advertising and consumer decision-making through bibliometric analysis.
2. To investigate the influence of AI-driven advertising on consumer purchase intention within digital marketplaces.
3. To examine the impact of AI-driven advertising on consumer trust and impulsive buying behaviour among digitally active consumers.
4. To evaluate the influence of AI-driven advertising on consumer decision-making efficiency within contemporary digital consumption environments.

### 5. Hypotheses Development

Based on the existing literature on AI-driven advertising and consumer behaviour, the following hypotheses have been formulated for empirical investigation:

#### HYPOTHESES 1

**H0:** AI-driven advertising does not significantly influence consumer purchase intention.

**H1:** AI-driven advertising significantly influences consumer purchase intention.

#### HYPOTHESES 2

**H0:** AI-driven advertising does not significantly influence consumer trust within digital marketplaces.

**H1:** AI-driven advertising significantly influences consumer trust within digital marketplaces.

#### HYPOTHESES 3

**H0:** AI-driven advertising does not significantly influence impulsive buying behaviour among digitally active consumers.

**H1:** AI-driven advertising significantly influences impulsive buying behaviour among digitally active consumers.

## HYPOTHESES 4

**H0:** AI-driven advertising does not significantly influence consumer decision-making efficiency.

**H1:** AI-driven advertising significantly influences consumer decision-making efficiency.

## 6. Research Methodology

The present study adopts a dual methodological framework integrating bibliometric investigation and empirical inquiry to examine the transformational influence of AI-driven advertising on contemporary consumer decision-making behaviour within digitally mediated marketplaces. The study is grounded within a quantitative research paradigm and follows an exploratory-cum-descriptive research design to generate both intellectual and behavioural insights associated with AI-enabled advertising ecosystems.

### 1 Research Design

The study employs a hybrid research design integrating bibliometric analysis and empirical investigation. The bibliometric component aims to systematically map the intellectual structure, publication trajectories, thematic evolution, and collaborative research patterns associated with AI-driven advertising and consumer decision-making. Simultaneously, the empirical component examines the behavioural influence of AI-driven advertising on digitally active consumers through Structural Equation Modeling (SEM).

### 2 Bibliometric Methodology

Secondary bibliographic data were extracted from the Dimensions database covering scholarly publications published between 2011 and 2025. Relevant documents were retrieved using keywords including "Artificial Intelligence," "AI-Driven Advertising," "Consumer Decision-Making," "Digital Marketing," and "Consumer Behaviour." Bibliometric analysis was conducted utilizing VOS viewer software for citation analysis, co-authorship mapping, keyword co-occurrence analysis, thematic evolution assessment, and scientific collaboration visualization.

### 3 Empirical Methodology

The empirical investigation examines the influence of AI-driven advertising on consumer purchase intention, consumer trust, impulsive buying behaviour, and decision-making efficiency among digitally active consumers. Primary data were collected through a structured questionnaire utilizing a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree."

#### 3.1 Construct Development

The measurement constructs incorporated within the study were adapted from previously validated Scopus-indexed scholarly investigations to ensure conceptual reliability and theoretical consistency.

Construct	Nature	No. of Items	Adapted From
AI-Driven Advertising	Independent Variable	4	Huang & Rust (2021); Dwivedi et al. (2021)
Purchase Intention	Dependent Variable	5	Dodds et al. (1991); Grewal et al. (2021)
Consumer Trust	Dependent Variable	5	Gefen et al. (2003); Ameen et al. (2021)
Impulsive Buying Behaviour	Dependent Variable	5	Rook & Fisher (1995); Verma et al. (2021)
Decision-Making Efficiency (2022)	Dependent Variable	4	De Bruyn et al. (2020); Chintalapati & Pandey

#### 3.2 Sampling Design and Sample Size

The study employs convenience sampling technique for the collection of empirical data from digitally active consumers frequently exposed to AI-driven advertising across social media platforms, e-commerce ecosystems, and digital marketplaces. A sample size 405 respondents was considered methodologically adequate for conducting Structural Equation Modeling (SEM) and ensuring statistical robustness, model stability, and analytical reliability.

#### 3.3 Data Collection Procedure

Primary data were collected through a structured online questionnaire distributed using Google Forms and various

digital communication platforms. Respondents were selected based upon their familiarity with digitally mediated advertising environments and online purchasing platforms.

#### 4 Reliability and Validity Assessment

The reliability and validity of the measurement constructs were assessed using Cronbach's Alpha, Composite Reliability (CR), Average Variance Extracted (AVE), and Confirmatory Factor Analysis (CFA). Subsequently, Structural Equation Modeling (SEM) utilizing AMOS 24 was employed to examine the hypothesized relationships among the study constructs and evaluate model fitness.

## 5 Statistical Tools Used

The empirical investigation was conducted utilizing SPSS 26 and AMOS 24 for descriptive statistics, reliability assessment, Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM). Simultaneously, bibliometric analysis and scientific mapping were performed using VOS viewer software.

## 7. Mapping The Intellectual Landscape of Ai-driven Advertising and Consumer Decision-making

To systematically examine the intellectual evolution of AI-driven advertising and consumer decision-making research, a bibliometric analysis was conducted using scholarly

publications retrieved from the Dimensions database. A total of 2,518 publications published between 2011 and 2025 were identified and analyzed using VOS viewer software. The bibliometric investigation seeks to uncover publication trends, collaborative research patterns, influential scholarly contributors, and the intellectual foundations underpinning this rapidly evolving research domain. By examining the structural characteristics of the literature, the analysis provides a comprehensive understanding of how academic discourse surrounding AI-driven advertising and consumer decision-making has developed over time and highlights emerging directions for future scholarly inquiry.

### 7.1 Co-Authorship Analysis (Countries)

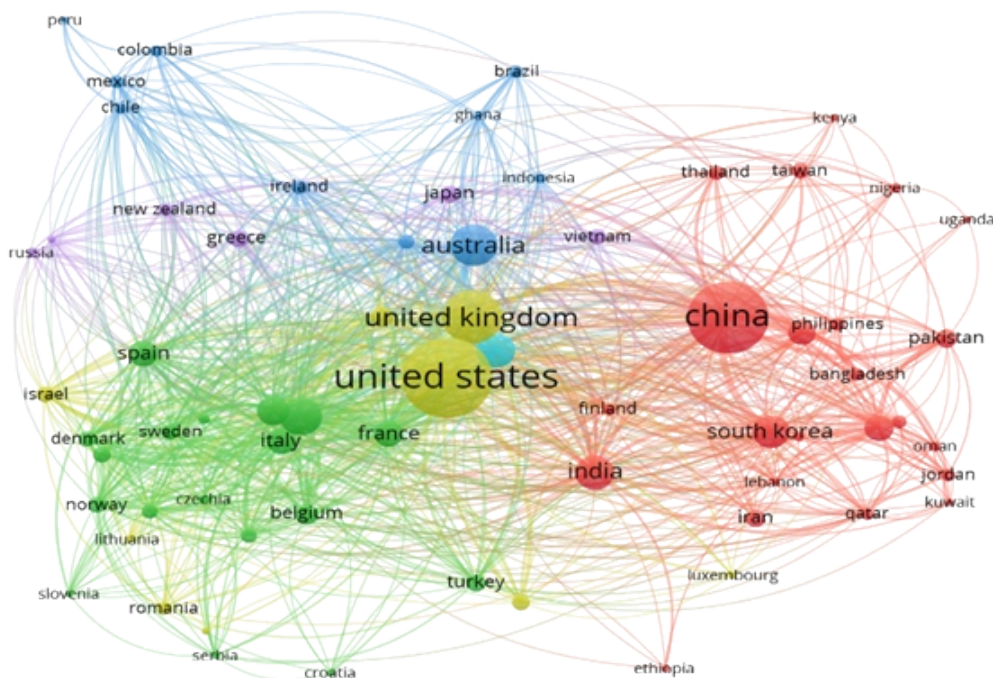


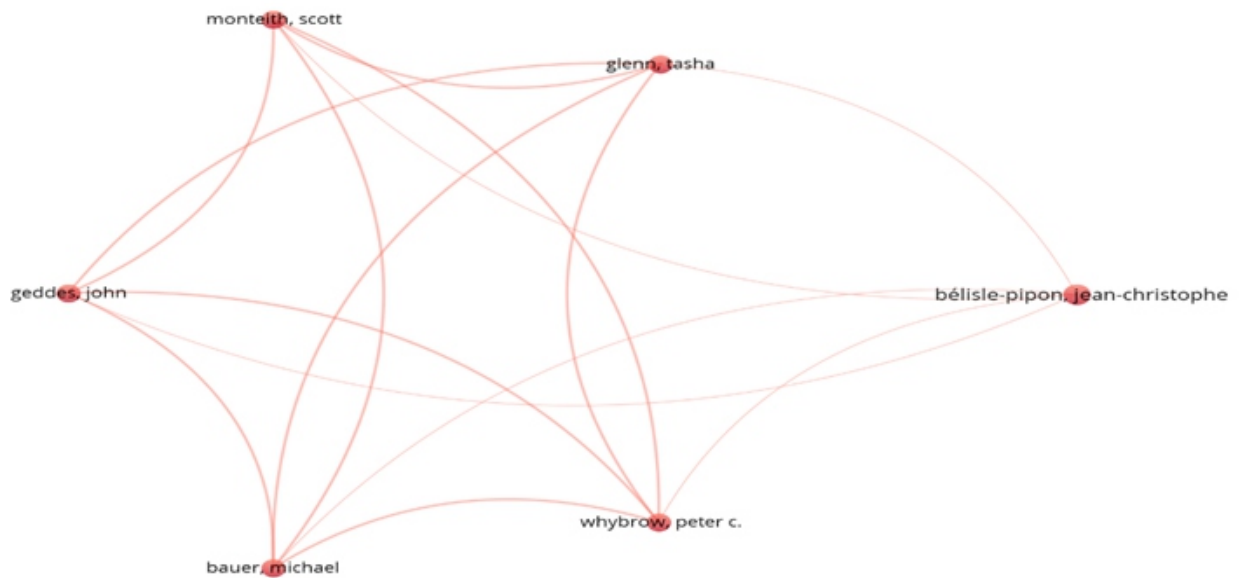
Fig 1: Co-Authorship Analysis (Countries)

The co-authorship analysis was conducted to examine international research collaboration within the field of AI-driven advertising and consumer decision-making. Using a minimum threshold of five documents and ten citations, 64 out of 104 countries met the inclusion criteria and were incorporated into the VOS viewer network. The visualization reveals a highly interconnected global research structure, indicating extensive cross-national collaboration. The United States emerged as the most influential country, demonstrating the largest node size and strongest collaborative linkages. Other prominent contributors include the United Kingdom, China, Australia, and India, reflecting their significant research output and scholarly influence within the domain. Furthermore, the network exhibits

distinct collaborative clusters, particularly among European and Asian countries, suggesting the existence of active regional research communities. Overall, the findings indicate that AI-driven advertising and consumer decision-making research has evolved into a globally collaborative field supported by strong international knowledge exchange and academic partnerships.

### 7.2 Citation Analysis (Authors)

The author citation analysis was conducted to identify influential scholars contributing to the field of AI-driven advertising and consumer decision-making. A minimum threshold of three publications and twenty citations was established, resulting in 59 authors meeting the inclusion criteria.



**Fig 2: Citation Analysis (Authors)**

The citation network highlights several influential authors, including Gedes John, Bauer Michael, Whybrow Peter C., Monteith Scott, Glenn Tasha, and B elisle-Pipon Jean-Christophe, who exhibit strong citation linkages within the network. The interconnected structure indicates the presence of a shared intellectual foundation supporting research on artificial intelligence, consumer behaviour, and digital transformation. Overall, the findings reveal that the field is supported by a relatively concentrated group of influential scholars whose contributions have significantly shaped contemporary research in this domain.

decision-making research. Using a minimum threshold of three citations, 19 authors met the inclusion criteria and were included in the network.

The visualization reveals two major intellectual clusters. Authors such as Slovic, Kahneman, and Tversky represent the behavioural decision-making perspective, while Ricci, Rokach, and Shapira are associated with artificial intelligence and recommendation system research. Overall, the findings indicate that the field is primarily built upon the integration of consumer psychology and AI-driven technological frameworks.

### 7.3 Author Co-Citation Analysis

The author co-citation analysis was conducted to identify the intellectual foundations of AI-driven advertising and consumer



**Fig 3: Author Co-Citation Analysis**

### 7.4 Bibliographic Coupling Analysis (Sources)

Bibliographic coupling analysis was conducted to identify the major publication sources contributing to the intellectual development of AI-driven advertising and consumer decision-

making research. A minimum threshold of 10 documents and 20 citations was established. Based on these criteria, 34 sources satisfied the inclusion requirements and were incorporated into the coupling network.



### Measurement Model Fit Indices

Fit Index	Obtained Value	Recommended Value	Status
$\chi^2/df$ (CMIN/DF)	1.643	< 3.00	Accepted
GFI	0.925	> 0.90	Accepted
AGFI	0.906	> 0.90	Accepted
NFI	0.931	> 0.90	Accepted
IFI	0.972	> 0.90	Accepted
TLI	0.967	> 0.90	Accepted
CFI	0.971	> 0.90	Accepted
RMSEA	0.040	< 0.08	Accepted
SRMR	0.038	< 0.08	Accepted

**Table 2:** Showing Measurement Model Fit Indices

### Interpretation

The results indicate that the measurement model demonstrates an excellent fit with the observed data. The chi-square to degrees of freedom ratio (CMIN/DF = 1.643) is well below the recommended threshold of 3.0, indicating satisfactory model parsimony. Furthermore, the incremental fit indices, including NFI (0.931), IFI (0.972), TLI (0.967), and CFI (0.971), exceed the recommended value of 0.90, confirming strong model adequacy.

Additionally, the absolute fit measures also indicate excellent model fit, with GFI (0.925) and AGFI (0.906) surpassing the acceptable threshold of 0.90. The RMSEA value of 0.040 and SRMR value of 0.038 are substantially below the recommended cut-off value of 0.08, indicating minimal residual error. Collectively, these findings confirm that the measurement model possesses satisfactory goodness-of-fit and is suitable for subsequent structural analysis.

### 8.2 Reliability and Convergent Validity Assessment

#### Construct Reliability and Convergent Validity

Construct	CR	AVE
AI-Driven Advertising (AIA)	0.897	0.685
Purchase Intention (PI)	0.892	0.625
Consumer Trust (CT)	0.874	0.582
Impulsive Buying Behaviour (IBB)	0.867	0.567
Decision-Making Efficiency (DME)	0.818	0.537

**Table 3:** Showing the Construct and convergent validity

### Interpretation

The reliability and convergent validity assessment indicates satisfactory psychometric properties for all study constructs. Composite Reliability (CR) values range from 0.818 to 0.897, exceeding the recommended threshold of 0.70, thereby confirming internal consistency reliability. Similarly, the Average Variance Extracted (AVE) values range from 0.537 to 0.685,

surpassing the minimum recommended criterion of 0.50. These findings demonstrate that the latent constructs explain more than 50 percent of the variance in their respective indicators, thereby establishing adequate convergent validity.

### 8.3 Factor Loading Assessment

#### Standardized Regression Weights:

Factors			Estimate
AIA4	<---	AIA	.797
AIA3	<---	AIA	.869
AIA2	<---	AIA	.785
AIA1	<---	AIA	.857
PI4	<---	PI	.834
PI3	<---	PI	.827
PI2	<---	PI	.779
PI1	<---	PI	.734
PI5	<---	PI	.773
CT4	<---	CT	.738
CT3	<---	CT	.809
CT2	<---	CT	.737
CT1	<---	CT	.721
CT5	<---	CT	.806
IBB4	<---	IBB	.724
IBB3	<---	IBB	.733
IBB2	<---	IBB	.801
IBB1	<---	IBB	.720
IBB5	<---	IBB	.782
DME4	<---	DME	.848
DME3	<---	DME	.836
DME2	<---	DME	.604
DME1	<---	DME	.603

**Table 4:** Showing the Factor Loadings

**Interpretation**

The standardized factor loadings ranged from **0.603** to **0.869**, exceeding the minimum recommended threshold of 0.60. The highest loading was observed for AIA3 (0.869), while the lowest loading was observed for DME1 (0.603). Since all indicator loadings are statistically acceptable and contribute substantially

to their respective constructs, no item deletion was required. The results therefore confirm satisfactory indicator reliability and construct representation.

**8.4 Discriminant Validity Assessment**

**Fornell–Larcker Discriminant Validity Matrix**

Construct	IBB	AIA	PI	CT	DME
IBB	<b>0.753</b>				
AIA	0.539	<b>0.828</b>			
PI	0.318	0.548	<b>0.790</b>		
CT	0.528	0.530	0.266	<b>0.763</b>	
DME	0.214	0.378	0.217	0.133	<b>0.733</b>

**Table 4:** Showing the Discriminant Validity Assessment

**Interpretation**

Discriminant validity was assessed using the Fornell-Larcker criterion. The square root of AVE for each construct was greater than its corresponding inter-construct correlations, thereby satisfying the recommended criterion for discriminant validity. Furthermore, all constructs exhibited AVE values greater than MSV, indicating the absence of discriminant validity concerns.

Consequently, the findings confirm that each construct is empirically distinct and captures a unique conceptual dimension within the proposed research framework.

Overall, the measurement model assessment confirms satisfactory model fit, internal consistency reliability, convergent validity, and discriminant validity. The findings establish the psychometric adequacy of the measurement

instrument and provide a robust foundation for proceeding with structural equation modeling to examine the hypothesized relationships among AI-driven advertising, purchase intention, consumer trust, impulsive buying behaviour, and decision-making efficiency.

## 9. Structural Model Assessment and Hypothesis Testing

### 9.1 Structural Model Evaluation

Following the establishment of measurement reliability and validity, Structural Equation Modeling (SEM) was employed using AMOS 24 to examine the hypothesized relationships among the study constructs. The structural model demonstrated satisfactory goodness-of-fit and met the recommended threshold values suggested in the SEM literature.

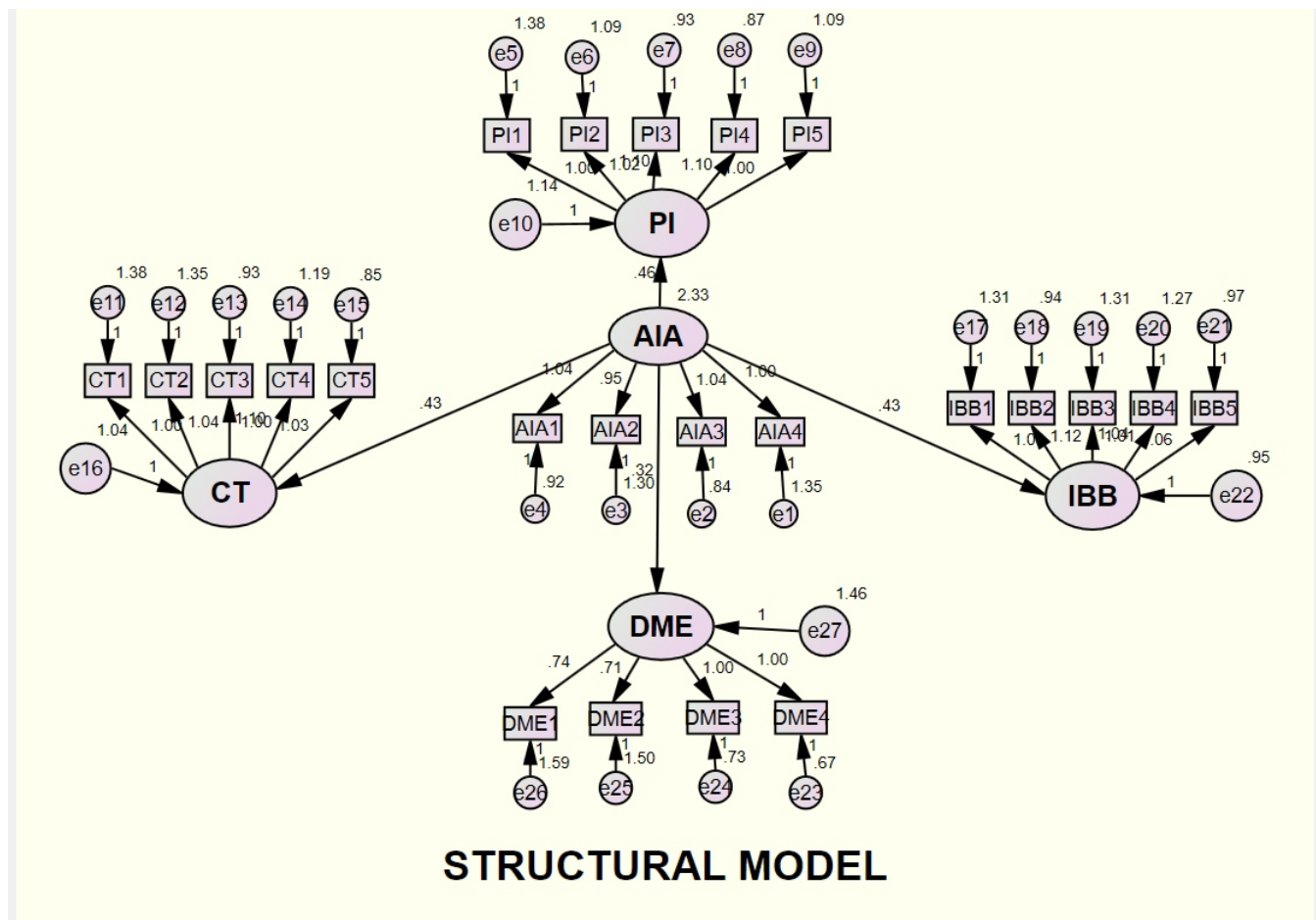


Fig 6: Structural Model

Fit Index	Obtained Value	Recommended Value	Status
CMIN/DF	1.755	< 3.00	Accepted
GFI	0.920	> 0.90	Accepted
AGFI	0.902	> 0.80	Accepted
NFI	0.924	> 0.90	Accepted
IFI	0.966	> 0.90	Accepted
TLI	0.961	> 0.90	Accepted
CFI	0.966	> 0.90	Accepted
RMSEA	0.043	< 0.08	Accepted
PCLOSE	0.945	> 0.05	Accepted

Table 5: Showing Structural Model Fit Indices

The findings indicate that the proposed structural model exhibits an excellent level of fit with the observed data. The RMSEA value of 0.043 and CFI value of 0.966 particularly demonstrate a strong correspondence between the theoretical framework and empirical observations. Therefore, the structural model was considered appropriate for hypothesis testing.

## 9.2 Hypothesis Testing

The structural relationships among the study constructs were evaluated using standardized path coefficients, critical ratios (C.R.), and significance values

Hypothesis	Relationship	Estimate ( $\beta$ )	C.R.	p-value	Decision
H1	AIA $\rightarrow$ PI	0.457	9.371	*** ( $p < 0.001$ )	Supported
H2	AIA $\rightarrow$ CT	0.429	9.085	*** ( $p < 0.001$ )	Supported
H3	AIA $\rightarrow$ IBB	0.429	9.323	*** ( $p < 0.001$ )	Supported
H4	AIA $\rightarrow$ DME	0.319	6.698	*** ( $p < 0.001$ )	Supported

**Tabel 6:** Showing Hypothesis testing

The results reveal that AI-Driven Advertising exerts a statistically significant positive influence on all four behavioural outcomes. The strongest effect was observed on Purchase Intention ( $\beta = 0.457$ ), followed by Consumer Trust ( $\beta = 0.429$ ) and Impulsive Buying Behaviour ( $\beta = 0.429$ ). Furthermore, AI-Driven Advertising demonstrated a positive influence on Decision-Making Efficiency ( $\beta = 0.319$ ). Consequently, all four proposed hypotheses were supported, indicating that AI-enabled advertising significantly shapes consumer behaviour within digitally mediated marketplaces.

## 10. Findings of The Study

The bibliometric investigation revealed that research relating to AI-driven advertising and consumer decision-making has evolved into a globally collaborative and multidisciplinary research domain. The co-authorship analysis highlighted strong international collaboration, with the United States, United Kingdom, China, Australia, and India emerging as major contributors. Citation and co-citation analyses further indicated that the intellectual foundation of the field is primarily built upon the integration of behavioural decision-making theories and artificial intelligence research streams.

The bibliographic coupling analysis demonstrated substantial thematic convergence among journals focusing on psychology, consumer behaviour, digital technologies, and management studies, reflecting the interdisciplinary nature of contemporary AI-enabled advertising research.

The empirical findings confirmed that AI-Driven Advertising significantly influences consumer purchase intention, consumer trust, impulsive buying behaviour, and decision-making efficiency. Among the examined relationships, the strongest

impact was observed on purchase intention, suggesting that personalized and algorithmically optimized advertising strategies effectively enhance consumers' willingness to purchase products and services. The findings further indicate that AI-enabled advertising contributes positively to consumer trust and facilitates more efficient decision-making processes within digital consumption environments.

## 11. Managerial Implications

The findings offer several important implications for marketers, digital platform operators, and business organizations. First, organizations should strategically invest in AI-driven advertising technologies to enhance personalization, customer engagement, and purchase conversion effectiveness. The significant influence of AI-driven advertising on purchase intention highlights its potential as a powerful mechanism for improving marketing performance.

Second, the positive association between AI-driven advertising and consumer trust suggests that firms should prioritize transparent and ethical AI implementation practices. Developing trustworthy AI-enabled communication systems may strengthen long-term consumer relationships and improve brand credibility.

Third, the significant impact on decision-making efficiency indicates that intelligent recommendation systems and personalized advertising frameworks can assist consumers in processing information more effectively within complex digital marketplaces. Organizations should therefore focus on delivering relevant, timely, and consumer-centric advertising experiences.

Finally, policymakers and regulatory bodies should formulate guidelines that promote ethical AI utilization, transparency, and responsible data governance to ensure that technological advancement remains aligned with consumer welfare and societal expectations.

## 12. Conclusion

The rapid advancement of artificial intelligence has fundamentally transformed the contemporary advertising landscape and reshaped consumer decision-making processes within digital environments. By integrating bibliometric analysis with empirical investigation, the present study provides a comprehensive understanding of both the intellectual evolution and behavioural implications of AI-driven advertising.

The bibliometric findings reveal a rapidly expanding and internationally collaborative research domain characterized by increasing interdisciplinary integration. Simultaneously, the empirical results confirm that AI-driven advertising significantly influences purchase intention, consumer trust, impulsive buying behaviour, and decision-making efficiency among digitally active consumers.

Overall, the study contributes to the growing body of knowledge on AI-enabled marketing by demonstrating that intelligent advertising technologies have become critical determinants of consumer behaviour in modern digital marketplaces. As artificial intelligence continues to evolve, organizations must balance technological innovation with ethical responsibility to create sustainable, consumer-centric advertising ecosystems successfully.

## 13. Limitations and Future Research Directions

Despite its contributions, the study is subject to certain limitations. First, the empirical investigation utilized convenience sampling, which may restrict the generalizability of the findings. Second, the study was conducted within a cross-sectional framework and therefore does not capture changes in consumer behaviour over time. Third, only selected behavioural outcomes were examined, while other relevant constructs such as consumer satisfaction, perceived risk, privacy concerns, and brand loyalty were not incorporated.

Future research may adopt longitudinal research designs, probability-based sampling approaches, and cross-cultural investigations to enhance the robustness and generalizability of findings. Additionally, future studies may explore moderating and mediating variables associated with ethical AI usage, consumer privacy perceptions, and algorithmic transparency to

advance understanding of AI-driven advertising within evolving digital ecosystems.

## References

- Ameen, N., Tarhini, A., Reppel, A., & Anand, A. (2021). *Customer experiences in the age of artificial intelligence*. *Computers in Human Behavior*, 114, 106548.
- Bleier, A., & Eisenbeiss, M. (2015). *The importance of trust for personalized online advertising*. *Journal of Retailing*, 91(3), 390–409.
- Cath, C., Wachter, S., Mittelstadt, B., Taddeo, M., & Floridi, L. (2018). *Artificial intelligence and the 'good society': The US, EU, and UK approach*. *Science and Engineering Ethics*, 24(2), 505–528.
- Chintalapati, S., & Pandey, S. K. (2022). *Artificial intelligence in marketing: A systematic literature review*. *International Journal of Market Research*, 64(1), 38–68.
- Davenport, T., Guha, A., Grewal, D., & Bressgott, T. (2020). *How artificial intelligence will change the future of marketing*. *Journal of the Academy of Marketing Science*, 48(1), 24–42.
- De Bruyn, A., Viswanathan, V., Beh, Y. S., Brock, J. K. U., & Von Wangenheim, F. (2020). *Artificial intelligence and marketing: Pitfalls and opportunities*. *Journal of Interactive Marketing*, 51, 91–105.
- Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). *Effects of price, brand, and store information on buyers' product evaluations*. *Journal of Marketing Research*, 28(3), 307–319.
- Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y., Dwivedi, R., Edwards, J., Eirug, A., Galanos, V., Ilavarasan, P. V., Janssen, M., Jones, P., Kar, A. K., Kizgin, H., Kronemann, B., Lal, B., Lucini, B., ... Williams, M. D. (2021). *Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy*. *International Journal of Information Management*, 57, 101994.
- Floridi, L., Cowsls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F., Schafer, B., Valcke, P., & Vayena, E. (2018). *AI4People—An ethical framework for a good AI society*. *Minds and Machines*, 28(4), 689–707.
- Gefen, D., Karahanna, E., & Straub, D. W. (2003). *Trust and TAM in online shopping: An integrated model*. *MIS Quarterly*, 27(1), 51–90.
- Grewal, D., Guha, A., Saturnino, C. B., & Schweiger, E. B. (2021). *Artificial intelligence: The new frontier of retailing*. *Journal of Retailing*, 97(1), 75–96.

- Haenlein, M., & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of AI. *California Management Review*, 61(4), 5–14.
- Huang, M. H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science*, 49(1), 30–50.
- Huang, M. H., & Rust, R. T. (2023). Engaged to a robot? The role of AI in service and consumer behavior. *Journal of Service Research*, 26(1), 3–15.
- Jarek, K., & Mazurek, G. (2019). Marketing and artificial intelligence. *Central European Business Review*, 8(2), 46–55.
- Kietzmann, J., Paschen, J., & Treen, E. (2018). Artificial intelligence in advertising: How marketers can leverage AI along the consumer journey. *Journal of Advertising Research*, 58(3), 263–267.
- Kotler, P., & Keller, K. L. (2016). *Marketing management* (15th ed.). Pearson.
- Kumar, V., Ramachandran, D., & Kumar, B. (2023). Influence of artificial intelligence on consumer engagement and digital marketing effectiveness. *Journal of Business Research*, 157, 113553.
- Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing*, 80(6), 69–96.
- Libai, B., Bart, Y., Gensler, S., Hofacker, C., Kaplan, A., Kötterheinrich, K., & Kroll, E. (2020). Brave new world? On AI and the management of customer relationships. *Journal of Interactive Marketing*, 51, 44–56.
- Martin, K., & Murphy, P. (2017). The role of data privacy in marketing. *Journal of the Academy of Marketing Science*, 45(2), 135–155.
- Mikalef, P., Gupta, M., Pappas, I. O., & Krogstie, J. (2022). Artificial intelligence capability and organizational performance. *Information & Management*, 59(4), 103638.
- Puntoni, S., Reczek, R. W., Giesler, M., & Botti, S. (2021). Consumers and artificial intelligence. *Journal of the Academy of Marketing Science*, 49(1), 81–99.
- Rai, A. (2020). Explainable AI: From black box to glass box. *Journal of the Academy of Marketing Science*, 48(1), 137–141.
- Rook, D. W., & Fisher, R. J. (1995). Normative influences on impulsive buying behavior. *Journal of Consumer Research*, 22(3), 305–313.
- Rust, R. T., & Huang, M. H. (2021). The service revolution and the transformation of marketing science. *Journal of Marketing*, 85(1), 1–20.
- Verma, S., Sharma, R., Deb, S., & Maitra, D. (2021). Artificial intelligence in marketing: Systematic review and future directions. *International Journal of Information Management Data Insights*, 1(1), 100002.
- Voorveld, H. A. M., Van Noort, G., Muntinga, D. G., & Bronner, F. (2018). Engagement with social media and social media advertising. *Journal of Advertising*, 47(1), 38–54.
- Zuboff, S. (2019). *The age of surveillance capitalism: The fight for a human future at the new frontier of power*. PublicAffairs

# Humanizing Artificial Intelligence at Work: Integrating Workplace Spirituality and Human–AI Collaboration Research

\*Yanshika Gulati

\*\*Devesh Kumar

## Abstract

*The rise in the integration of Artificial Intelligence (AI) into organizational processes has changed the way we work, and it has led to both new opportunities and challenges for employees and organizations. This study aims to fill this gap in knowledge by systematically reviewing the literature on Human–AI Collaboration through the lens of Workplace Spirituality. Using the SPAR-4-SLR methodology provides a synthesis of scholarly contributions between 2015 and 2026 and an analysis of existing knowledge using two frameworks, the Antecedents–Decisions–Outcomes (ADO) framework and the Theory–Context–Characteristics–Methodology (TCCM) framework. The synthesis highlights that there are several organizational factors, such as AI readiness and digital transformation, a human-centered culture within the organization, and strong ethical leadership within the organization, that support and/or facilitate effective Human–AI Collaboration. By using these findings, we have determined that Workplace spirituality is a central mechanism by which employees can derive meaning, purpose, connectedness, and trust from their interactions with intelligent technologies. The research findings lead to the formulation of a thorough conceptual framework that brings together the three dimensions of technological, psychological, and spiritual aspects of Human-AI Collaboration. In addition to expanding existing literature about Human-AI Collaboration beyond just productivity and performance, the review demonstrates that to create a human-centered and sustainable digital transformation within our workplaces, we must also consider the role of spirituality as an element of workplace design. The study also offers a future research agenda aimed at informing the future scholarly exploration of the developing relationship between AI, workplace spirituality, and employee well-being in an Industry 5.0 context.*

**Keywords:** Human–AI Collaboration; Workplace Spirituality; SPAR-4-SLR; ADO Framework; TCCM Framework.

## Introduction

Artificial Intelligence (AI) has ushered in an unprecedented level of change in how work will be done; indeed, it is creating one of the most significant shifts in the history of work, fundamentally changing both the structure and organizational processes across sectors, as well as employee roles and the decision-making systems used in businesses. Technological innovations such as machine learning (ML), natural language processing (NLP), predictive analytics, and robotics—along with generative AI—have now transitioned from their original stages of experimentation to become essential and foundational elements of all business operations. The emerging paradigm for work is termed Human–AI Collaboration (HAIC), and is based on the complementary strengths of both human workers and intelligent technologies (Hemmer et al., 2023; Shahid et al., 2025). Specifically, when viewed through this lens, AI brings

efficiency by providing computational power, analytical capacity, predictive accuracy, and the potential for automation to organizations; while humans bring creativity, emotional intelligence, ethical reasoning, contextual judgment, empathy, and the ability to ascribe meaning to their work. The goal of HAIC is to support and enhance the worker's ability through collaborative intelligence systems where both artificial and human intelligence are able to work together (Shahid et al., 2025). HAIC closely follows the approach of Industry 5.0, which promotes a human-centric approach toward technological advancement. In contrast to Industry 4.0, which was primarily focused on automation, connectivity, and digitalization, Industry 5.0 focuses on supporting human creativity, worker well-being, and environmental sustainability within technologically advanced work environments. The

\*Research Scholar, HPKV Business School, School of Commerce and Management Studies, Central University of Himachal Pradesh Dharamshala India, Email: gulatiyanshika09@gmail.com

\*\*Associate Professor, HPKV Business School, School of Commerce and Management Studies, Central University of Himachal Pradesh Dharamshala India, Email: devesh.sharma@gmail.com

collaboration between humans and AI marks a new change in focus from being totally automated to enhancing how people interact with technology and use it to work (Pepito et al., 2026). This represents a recognition that in order for organizations today to be successful means not only having sophisticated technologies, but also being able to effectively work together as a team with intelligent systems. Literature has identified numerous challenges associated with working in an AI-based work environment and these include technostress, fears of job loss, unclear roles, algorithmic tracking of workers, privacy issues, less autonomy as compared to non-AI work environments, and concerns about how AI can replace certain jobs (Wagan & Sidra, 2025). Concern related to working with AI includes uncertainties about one's future role in the Work environment and what will happen with how they'll be evaluated based on their job performance and whether AI will have any effect on their identity. There are several issues affecting employee engagement, job satisfaction, trust, and psychological well-being caused by technology. Digital transformations have also changed the way people interact with one another within an organization. According to Walter (2024), technology impacts how employees think, feel, act, and connect to others; however, at the same time, psychological factors influence how employees accept and trust technology and make decisions based on technology. The introduction of technology in the workplace raises significant questions about how employees can maintain their dignity, purpose, and overall well-being within an AI-empowered environment (Das, 2025). Within this context of developing AI-enhanced workplaces, workplace spirituality allows researchers to understand employee experiences in high-tech workplaces. Workplace spirituality refers to the experience of doing meaningful work, being part of a community, feeling connected to coworkers, being authentic, and having strong alignment between their individual and the company's core values (Pande & Pande, 2024). As workplace spirituality becomes more prominent, organizations are attempting to manage the employee effects of the digital transformation. Employees are looking for more than just a paycheck; they want a satisfying environment that gives them the opportunity to grow and contribute meaningfully to society (Pande & Pande, 2024). Recent research has begun to study the effect of artificial intelligence on workplace spirituality. Current evidence appears to show that AI technologies can enhance and support employees' spiritual development and well-being via digital coaching systems, mindfulness apps, virtual support tools, and personalized development interventions (Bommiseti & Appana, 2024). On the one hand, researchers have raised the issue of spiritual confusion, identity issues, and creating meaning at work in regards to excessive dependence on technology (Alkhouri, 2025). As a result, workplace spirituality may be an important resource to help employees cope with technological change by providing them with meaning, purpose, and psychological well-

being. Another new area of research interest is compassion in the context of human and AI interaction. Morrow et al. (2023) have suggested through a systematic review that a Human-AI Intelligent Caring System can result from wise integration of AI technologies into human-centered organizational systems, thus contributing to compassionate outcomes. The purpose of this study is to integrate knowledge across the fields of workplace spirituality, digital psychology, compassion, AI-enabled HRM, and Human-AI Collaboration into a comprehensive conceptual framework of employee well-being and organizational resilience in AI-enabled workplaces. This study brings together disjointed research streams to advance the body of knowledge about human-centered digital transformation and to set out an agenda for future research in developing meaningful, compassionate, and sustainable workplaces in the era of artificial intelligence. This review of existing literature addresses the following research questions:

RQ1: What are the key conceptual foundations, contexts, characteristics, and methodological approaches used to develop literature regarding human-AI collaboration and workplace spirituality?

RQ2: What important antecedents, mediating factors, and outcomes can be identified within the literature available on human-AI collaboration and workplace spirituality?

RQ3: In what way does workplace spirituality, confidence in AI, compassion, spiritual intelligence, and psychological safety create a relationship between human-AI cooperation, employee outcomes and organizational outcomes?

RQ4: What future research suggestions might be recognized regarding the contemplation of the TCCM framework to develop a better comprehension of human-AI cooperation and workplace spirituality within AI-enabled workplaces?

## **Literature Review**

The review employs Systematic Literature Review (SLR) methodology as a means of collecting and interpreting the new accumulation of knowledge concerning Human-AI Collaboration (HAIC) and Workplace Spirituality (WPS). To ensure methodological rigor and transparency and replicability, the review follows the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR) developed by Paul et al. (2021). In addition to SPAR-4-SLR, two additional frameworks will be employed. First, the Antecedents- Decisions- Outcomes (ADO) framework is used to identify key antecedents that enable Human-AI collaboration within spiritually healthy workplaces, the decisions that organizations and individuals make regarding how to practice collaboratively, and the consequences of collaborative behaviors for employees and businesses. The second framework, Theory- Context- Characteristics- Methodology (TCCM), will be used to systematically review the theoretical foundations underlying

previous studies, the context in which the antecedents and decisions occurred, the characteristics of constructs employed within the studies, and methods used for doing the research. Together, these two frameworks provide a structured way to examine the existing body of research while revealing gaps in theory, context, and methodology that require further research.

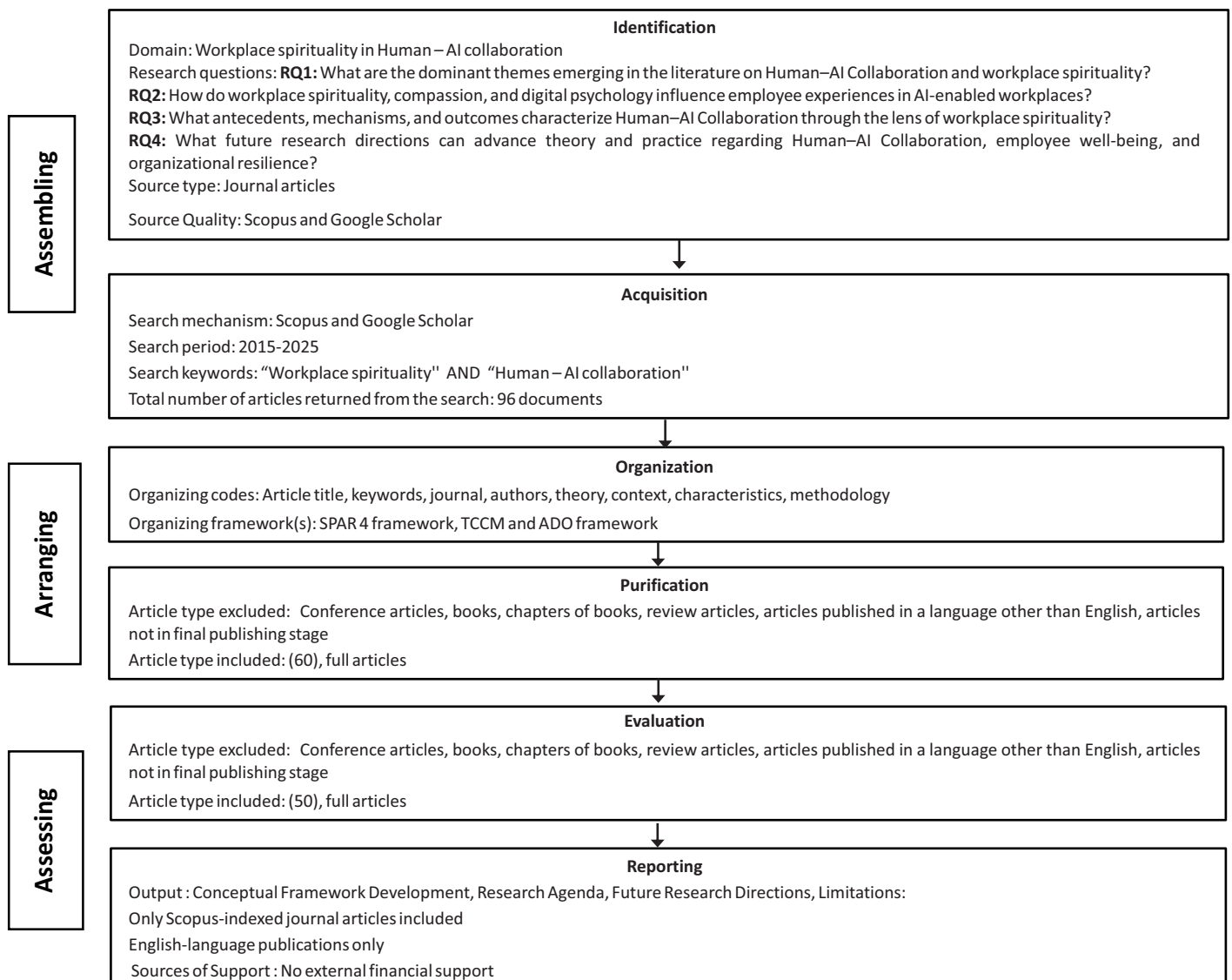
### SPAR-4-SLR Framework

To gather data, the SPAR-4-SLR methodology (Figure 1) is employed in the present research. According to Paul et al. (2021), it contains three primary stages: assembling, arranging, and assessing publications.

#### Assembling

The sub-stages of the assembling stage of the review protocol are identification and acquisition. The identification involves a definition of the research area, source quality and source type.

Furthermore, in the acquisition phase, the analysis was conducted without regard to a time frame, and in May 2025, a database search was carried out in electronic databases (Scopus and Google scholar). Scopus was used for data collecting because of its extensive coverage and rigorous indexing (Materla et al., 2019). Scopus has around 60% greater coverage. Based on the study's aim a specific research string was created using the keywords such as "Workplace spirituality" AND "Human – AI collaboration" was refined using terms from earlier study and thesaurus and experts also review these keywords to ensure their relevance. A total of 96 studies were found in Scopus using these search keywords. SPAR – 4. The systematic review process adopted in this study is illustrated in Figure 1, which presents the SPAR-4-SLR framework encompassing the sequential stages of assembling, arranging, and assessing the literature to ensure a rigorous and transparent review process.



**Figure 1.** SPAR-4-SLR Protocol-Based Systematic Literature Review Process for Human–AI Collaboration and Workplace Spirituality. Source: Authors' illustration based on Paul et al. (2021).

### Arranging

The purification and organization substages were part of the arranging phase of this review. Article data were categorized for organization based on the author's name, country of affiliation, title, abstract, and keywords. To examine different aspects of the literature, the TCCM framework was chosen. Only articles from the "Business, Management, and Accounting" subject category in Scopus were chosen for the first purification phase. Only reviews and scholarly publications written in English were included, by Lim et al. (2022) and Fetscherin and Heinrich (2015). In this first stage, 926 papers that met the inclusion criteria were found. The second stage of the selection process was methodical and focused on the goals and research questions of the study (Tranfield et al., 2003). Finally, titles, abstracts, and keywords were used to filter articles. There were 50 documents in the final dataset.

### Assessing

The assessment stage of the SPAR-4-SLR procedure involves reporting the results and evaluating the literature that was selected. The peer-reviewed papers that were part of our dataset were subject to a content analysis for assessment purposes. A framework-based technique, like TCCM-ADO, was employed for choosing the above articles (Wolf, 2023). After the articles about AI usage in SMM or similar subjects were selected, each one was thoroughly examined by providing in-depth knowledge that could advance our understanding of AI in SMM.

### TCCM Analyses

Based on findings from TCCM analysis, it appears that research on Human-AI Collaboration and Workplace Spiritualism continues to evolve without a solid theoretical base upon which to build. This is evidenced by the reliance on the Technology

Acceptance Model (TAM), Human-centered AI theory, Workplace Spirituality theory, Social Exchange Theory (SET), and Organizational Support Theory (OST) to provide context, while no integrated framework exists to connect these different perspectives (Davis, 1989; Eisenberger et al., 1986). Literature tends to be biased towards industrialized countries, with most published work lying within technology-centric sectors such as IT, healthcare, HRM, and education. As a result, there has been little published work demonstrating empirical support for these constructs within emerging economies or cultures (Mariani & Dwivedi, 2024). In terms of characteristics, the majority of work is centered around AI use and the degree of individual's trust, engagement, and job satisfaction while working with AI. However, remarkable constructs such as compassion, spiritual intelligence, psychological safety, and organizational resilience have not been given adequate attention even though they are likely to play an important role in Human-AI Collaboration (Ashmos & Duchon, 2000; Fry, 2003). The methodological approach to studying Human-AI Collaboration has largely been dominated by the quantitative survey methodology and SEM analysis of longitudinal research which fails to provide rich insights into relationships among the variables. There has also been very limited application of qualitative or mixed methodologies in this field. Future studies should consider applying a wider variety of research designs in order to improve causal reasoning and gain more meaningful insights into how AI will change workplaces in the near future (Podsakoff et al., 2003). Overall, there needs to be greater emphasis put toward developing integrated theoretical frameworks, broadening research to incorporate an array of settings, and increasing published output from areas where Human-AI Collaboration exists beyond the traditional context of workplaces (e.g., Home/Social setting). The theories related to the Human – AI collaboration is shown below in table 1.

**Table 1.** Major Theories Used in the Literature

Theory	No. of Articles	Implementation in Human–AI Collaboration and Workplace Spirituality Research	Exemplary Studies
Workplace Spirituality Theory (Ashmos & Duchon, 2000)	10	Explains how meaningful work, sense of community, and value alignment influence employee well-being, engagement, and resilience in AI-enabled workplaces.	Ashmos & Duchon (2000); Milliman et al. (2003); Pande & Pande (2024); Lawande & Venkatesh (2025)
Human-Centered AI Theory	8	Emphasizes the integration of AI with human values, dignity, ethics, and employee well-being rather than purely technological efficiency.	Walter (2024); Shahid et al. (2025); Pepito et al. (2026)
Technology Acceptance Model (TAM) (Davis, 1989)	7	Explains employee acceptance, adoption, and usage intentions toward AI systems based on perceived usefulness and ease of use.	Davis (1989); Wagan & Sidra (2025)

Social Exchange Theory (SET) (Blau, 1964)	5	Examines reciprocal relationships between organizations and employees during AI-driven workplace transformation.	Blau (1964); Cropanzano & Mitchell (2005)
Organizational Support Theory (OST) (Eisenberger et al., 1986)	4	Explains how perceived organizational support influences trust, adaptation, and employee well-being during AI adoption	Eisenberger et al. (1986); Rhoades & Eisenberger (2002)
Digital Psychology Theory (Walter, 2024)	4	Explains how digital technologies influence employee cognition, emotions, trust, and behavioral responses in AI-enabled workplaces.	Walter (2024)
Compassion Theory (Morrow et al., 2023)	3	Explores how empathy, care, and supportive relationships facilitate human-centered AI implementation and employee well-being.	Morrow et al. (2023); Das (2025)
Self-Determination Theory (SDT) (Deci & Ryan, 2000)	3	Explains the role of autonomy, competence, and relatedness in shaping employee experiences during Human–AI Collaboration.	Deci & Ryan (2000); Ryan & Deci (2001)
Job Demands–Resources (JD-R) Theory (Bakker & Demerouti, 2007)	3	Explains how workplace spirituality functions as a psychological resource that mitigates technological stress and supports employee well-being.	Bakker & Demerouti (2007); Tarafdar et al. (2019)
Positive Organizational Scholarship (POS) (Cameron et al., 2003)	3	Highlights employee flourishing, resilience, meaningful work, and sustainable organizational performance in AI-enabled workplaces.	Cameron et al. (2003); Karakas (2010)
Total	50	—	—

**Source:** Authors' synthesis of the reviewed literature (2015–2026).

Research on Human–AI Collaboration and Workplace Spirituality draws on three main sources for its theoretical foundations: Workplace Spirituality Theory, Human-Centered AI Theory and the Technology Acceptance Model (TAM). These three theories address employee experiences, AI adoption, meaningfulness of work and human-centered technology implementations. Despite these three main sources, the current literature lacks theoretical integration among technological, psychological and spiritual perspectives, which suggests there is a need to develop an overall framework that connects elements of workplace spirituality, trust in AI, compassion and employee well-being, so as to explain the sustainability of Human–AI Collaboration.

### Context

Most of the articles that have been studied regarding Human–AI Collaboration, workplace spirituality, and digital transformation in advanced economies have come from Asia, Europe, and North America. There are very few articles published from developing countries or within Africa or between cultures, which presents a significant gap in what researchers should study. Future research should investigate Human–AI Collaboration and workplace spirituality across diverse cultural, institutional, and industrial settings to improve the generalizability of existing findings and advance a more global understanding of AI-enabled workplaces. Country wise context has been shown in table 2.

**Table 2.** Geographical context of the studies

Country/Region	No. of Studies	Exemplary Studies
North America (USA & Canada)	8	Morrow et al. (2023); Hemmer et al. (2023); Wilson and Daugherty (2018); Glikson and Woolley (2020); Cameron et al. (2003); Ashmos and Duchon (2000); Duchon and Plowman (2005); Milliman et al. (2003)
Europe	12	Walter (2024); Alkhouri (2025); Lawande and Venkatesh (2025); Shahid et al. (2025); Pepito et al. (2026); Raisch and Krakowski (2021); Karakas (2010); Pawar (2009); Bakker and Demerouti (2007); Ryan and Deci (2000); Waterman (1993); Tarafdar et al. (2019)
Africa	2	Emerging studies examining AI, spirituality, and workplace transformation in developing economies
Oceania (Australia & New Zealand)	2	Studies focusing on digital transformation, employee well-being, and AI adoption
Cross-country / Global Studies	5	Paul et al. (2021); Dwivedi et al. (2021); Human-centered AI and Industry 5.0 studies
Country Not Explicitly Reported	3	Conceptual and review-based studies where geographical context was not specified
Total	5	—

**Content Analyses**

For content analysis, 50 Articles from Scopus Database has been selected after filtration, that helped in identifying the Antecedents and outcomes of the DFL as indicated in Table 8. The ADO (Antecedents–Decisions–Outcomes) framework for Human–AI Collaboration through the lens of Workplace Spirituality. The study's results suggest that Human-AI Collaboration is enhanced by various organizational and technological factors, such as AI readiness (the capability to adopt artificial intelligence), digital transformation (the process of leveraging advanced digital tools and technology), and a human-centered culture. The development of a highly engaged

and committed human workforce through compassion, workplace spirituality, spiritual intelligence, trust in AI, and psychological safety all enhance human-AI Collaboration. Collectively, these core antecedents produce beneficial results around employee well-being, meaningful work, organization citizenship behaviour, Human-AI synergy and organization resilience. The framework provides a basis for organisational success through the integration of human-centred values with Artificial Intelligence (AI) technologies. The values associated with this framework can be found at Table 3 of the document, which corresponds to the characteristics identified as part of the ADO model used to assess the TCCM in this analysis.

**Table 3.** ADO Framework Analysis

ADO Dimension	Theme	Representative Concepts	Role in Human–AI Collaboration
Antecedents (A)	AI Readiness	AI literacy, digital competencies, technological preparedness, employee readiness	Establishes the organizational and individual capability required for successful AI integration and collaboration.
	Digital Transformation	Digital innovation, process automation, data-driven decision-making, technological infrastructure	Creates an enabling environment where AI technologies become embedded in organizational processes and workflows.
	AI Adoption	Technology acceptance, perceived usefulness, perceived ease of use, implementation readiness	Facilitates employee willingness to engage with and utilize AI systems in daily work activities.

	Human-Centered Culture	Employee empowerment, inclusiveness, collaboration, employee-centric values	Ensures that AI implementation remains aligned with human needs, well-being, and organizational values.
	Ethical Leadership	Transparency, fairness, accountability, responsible AI governance	Promotes trust and ethical decision-making during AI-enabled organizational transformation.
Decisions / Mechanisms (D)	Workplace Spirituality	Meaningful work, sense of community, alignment of values, purpose at work	Acts as a central mechanism through which employees derive meaning and purpose while interacting with AI technologies.
	Compassion	Empathy, care, kindness, supportive relationships, prosocial behavior	Strengthens interpersonal relationships and reduces resistance to technological change.
	Spiritual Intelligence	Self-awareness, transcendence, value-based decision-making, purpose orientation	Enables employees to navigate technological disruption while maintaining ethical and value-driven perspectives.
	Trust in AI	Reliability, transparency, explainability, fairness, security	Encourages employee acceptance of AI systems and enhances collaborative human–AI interactions.
	Psychological Safety	Open communication, learning orientation, innovation, risk-taking	Fosters a supportive environment where employees feel comfortable experimenting and collaborating with AI systems.
Outcomes (O)	Employee Well-being	Psychological health, emotional well-being, work satisfaction, reduced stress	Reflects the positive impact of spiritually supportive Human–AI Collaboration on employees.
	Meaningful Work	Purpose, fulfillment, engagement, intrinsic motivation	Represents employees' perception that AI-enabled work contributes to personal and professional growth.
	Organizational Citizenship Behaviour (OCB)	Helping behavior, cooperation, voluntary contributions, organizational commitment	Demonstrates enhanced employee willingness to contribute beyond formal job requirements.
	Human–AI Synergy	Co-creation, complementary capabilities, collaborative intelligence, augmented performance	Reflects the effective integration of human creativity and AI efficiency.
	Organizational Resilience	Adaptability, agility, innovation capability, sustainable performance	Enables organizations to respond effectively to technological disruption and environmental uncertainty.

### Methodology Used

The findings from the methodology review demonstrate that the primary types of research methods used in the current literature on Human-AI Collaboration and Workplace Spirituality are predominantly quantitative studies using

quantitative survey techniques, Structural Equation Modelling (SEM), systematic literature reviews (SLRS), and bibliometric analyses. In contrast, there is very limited use of longitudinal, experimental, mixed-method and multi-level study designs in the existing literature, which restricts our ability to determine

causal relationships between elements of Human-AI Collaboration and to measure how Human-AI Collaboration evolves over time. Therefore, future research should utilise more rigorous methodologies such as longitudinal studies,

cross-cultural studies, experimental study designs, and mixed-method studies. Table 4 shows the methodology part in the TCCM framework.

**Table 4.** Methodology used in the studies

<b>Methodology</b>	<b>Application in Literature</b>	<b>Key Insights Generated</b>	<b>Future Research Opportunities</b>	<b>Representative Sources</b>
Quantitative Surveys	Widely used to examine relationships among AI adoption, trust in AI, workplace spirituality, employee well-being, and organizational outcomes.	Provides empirical evidence on employee attitudes, perceptions, and behavioral intentions.	Conduct large-scale cross-cultural and multi-industry survey studies.	Pande & Pande (2024); Wagan & Sidra (2025); Lawande & Venkatesh (2025)
Structural Equation Modeling (SEM)	Frequently employed to test mediation and moderation relationships among workplace spirituality, trust in AI, and employee outcomes.	Validates complex causal relationships and theoretical frameworks.	Develop integrated Human–AI–Spirituality models using SEM and PLS-SEM.	Pande & Pande (2024); Das (2025); Mahmood et al. (2018)
Systematic Literature Reviews (SLR)	Used to synthesize fragmented literature on Human–AI Collaboration, AI-HRM, workplace spirituality, and digital transformation.	Identifies research trends, gaps, and conceptual developments.	Expand reviews using bibliometric, scientometric, and meta-analytic approaches.	Morrow et al. (2023); Shahid et al. (2025); Wagan & Sidra (2025)
Bibliometric Analysis	Maps intellectual structure, publication trends, influential authors, and emerging themes.	Provides an overview of research evolution and knowledge networks.	Conduct science mapping studies on Human–AI Collaboration and Workplace Spirituality.	Lawande & Venkatesh (2025)
Qualitative Studies	Uses interviews, thematic analysis, conceptual exploration, and case-based inquiry to understand employee experiences with AI.	Generates deeper understanding of meaning-making, trust, compassion, and adaptation processes.	Explore employee narratives regarding workplace spirituality and AI-enabled work environments.	Walter (2024); Ali et al. (2024); Kwon et al. (2026)
Mixed-Methods Research	Limited application in current literature.	Combines quantitative generalizability with qualitative depth.	Integrate surveys, interviews, and case studies to better understand Human–AI Collaboration dynamics.	Emerging opportunity identified across reviewed studies

Longitudinal Studies	Rarely employed in existing Human–AI Collaboration research.	Captures changes in employee attitudes, trust, and well-being over time.	Investigate long-term effects of AI adoption on workplace spirituality and organizational resilience.	Research gap identified by Paul et al. (2021) and Walter (2024)
Experimental Research	Limited use in AI and workplace spirituality studies.	Establishes causal relationships between AI characteristics and employee responses.	Examine the effects of AI transparency, explainability, and ethical leadership on trust and meaningful work.	Research gap identified by Morrow et al. (2023) and Walter (2024)
Multi-Level Analysis	Underutilized in current studies.	Explores interactions among individual, team, and organizational factors.	Investigate Human–AI Collaboration across employee, team, leadership, and organizational levels.	Future opportunity identified across Human–AI Collaboration literature
Multi-Level Analysis	Underutilized in current studies.	Explores interactions among individual, team, and organizational factors.	Investigate Human–AI Collaboration across employee, team, leadership, and organizational levels.	Future opportunity identified across Human–AI Collaboration literature

**Source:** Authors' synthesis of the reviewed literature (2015–2026).

#### 4. Results and Discussion

It seems we should not only think of Human-AI Collaboration as a technology-based phenomenon. Instead, it includes many different ways of doing business and encompasses both technology and the people using the technology. This review has found that workplace spirituality is a key aspect of humanity in the AI-enabled workplace. By supporting employees with meaningful work, community, value-alignment, compassion, and trust in their work environment, spirituality can help them successfully navigate this period of technological change while maintaining their well-being and organizational commitment. Digital Psychology discusses how employees react to AI systems

from a psychological perspective, while Compassion Theory explains how important empathy and dignity are in ensuring that employees feel connected to one another through shared experiences. Organizations that provide people-centered HRM practices use these principles to bring about a more effective workplace for everyone. Combined, these findings clearly demonstrate that successful Human-AI Collaboration requires two components — advanced technology, and the ability of the organization to create a meaningful, compassionate, and spiritually enriching workplace. Creating these workplaces will increase employee well-being; promote resilience for organizations during transitions to AI; and contribute to long-term sustainable performance in the age of AI. The output of TCCM–ADO framework is shown in figure 2.

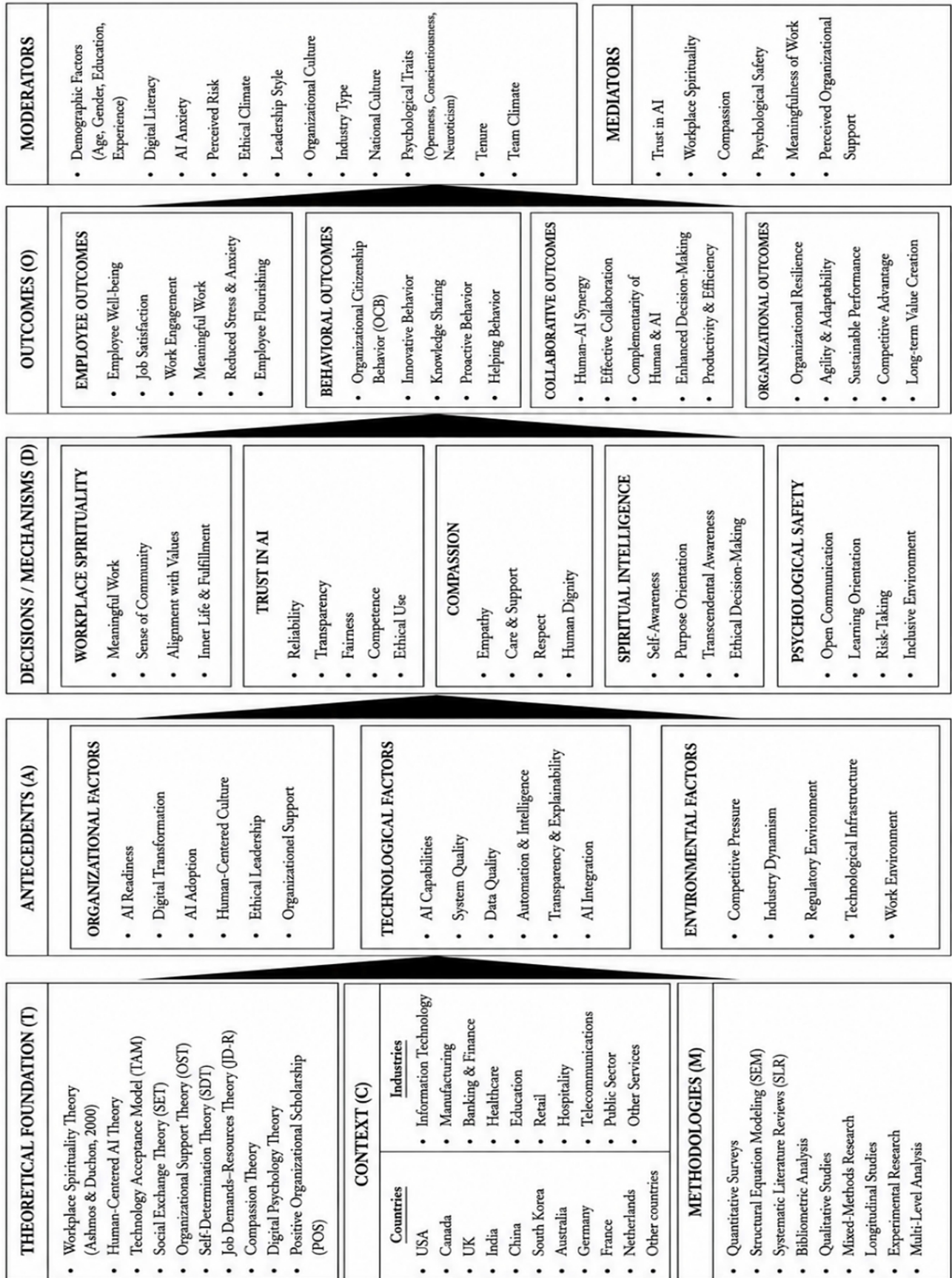


Figure 2. TCCM – ADO Results

## Development of the Conceptual Framework

This study explores workplace spirituality as a framework for understanding how humans and artificial intelligence (AI) collaborate in the workplace. Through a literature review and analysis (SPAR-4-SLR process), thematic synthesis, and application of the ADO framework and TCCM analysis, we propose a conceptual model that illustrates how workplace spirituality acts as a mechanism for connecting technological advancement and enhanced employee outcomes in AI-enabled workplaces. Specific antecedents (i.e., AI-enabled HRM practices, digital transformation, and human-centered leadership) have been identified as critical enablers of

successful human and AI collaboration. Further, key mediating mechanisms (i.e., compassion, workplace spirituality, trust in AI, and spiritual intelligence) contribute to creating meaning, purpose, and confidence for employees when interacting with AI systems. As a result, these mediating mechanisms support employee well-being, provide meaningful work experiences, promote organizational resilience, and yield sustainable organizational performance. This framework underscores the importance of integrating human values and spiritual dimensions with technological advances to achieve innovative and sustainable human-AI collaboration. From the TCCM – ADO frameworks conceptual framework is developed and shown in figure 3.

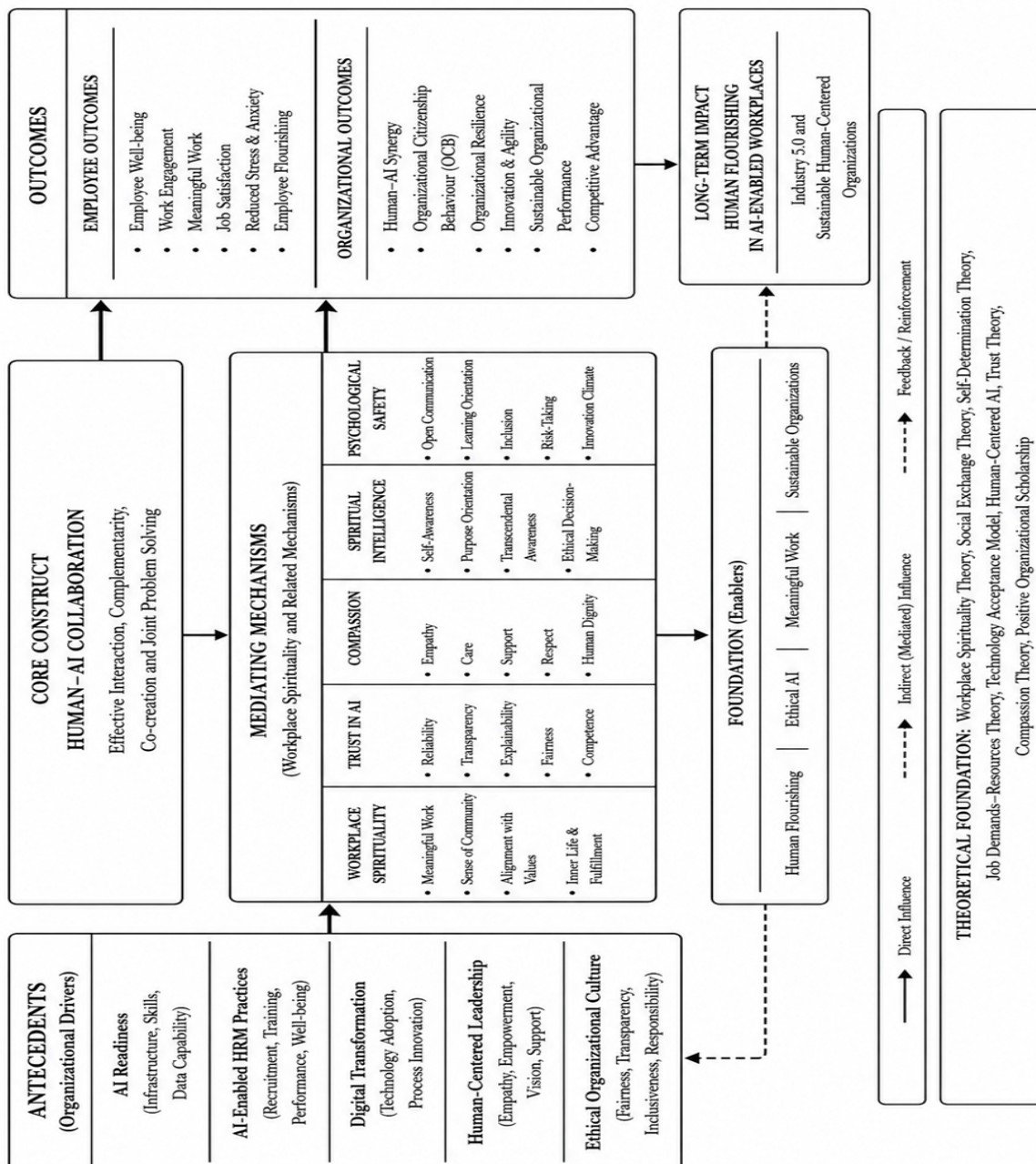


Figure 3. Conceptual framework developed from reviews (created by author)

## TCCM-Based Future Research Agenda

Table 6 outlines a set of future research questions derived from the TCCM (Theory, Context, Characteristics, and Methodology) framework. The proposed questions address key gaps identified in the existing literature and provide directions for advancing

knowledge on the role of workplace spirituality in fostering effective human–AI collaboration. By highlighting theoretical, contextual, construct-related, and methodological opportunities, the table serves as a roadmap for future research in this emerging interdisciplinary domain.

**Table 6.** Future Research Questions Based on TCCM Analysis

Dimension	Research Gap	Potential Research Question
Theory	Absence of an integrated Human–AI–Spirituality framework	How does workplace spirituality mediate the relationship between AI adoption and employee well-being?
Theory	Limited application of positive psychology theories	Can Human Flourishing Theory explain sustainable Human–AI Collaboration outcomes?
Context	Underrepresentation of developing economies	How do cultural values influence workplace spirituality and trust in AI?
Context	Limited sectoral diversity	How does Human–AI Collaboration differ across industries and organizational settings?
Characteristics	Neglect of compassion and spiritual intelligence	What role do compassion and spiritual intelligence play in fostering Human–AI synergy?
Characteristics	Limited focus on organizational resilience	Can workplace spirituality enhance organizational resilience during AI-driven transformation?
Methodology	Lack of longitudinal studies	How do employee attitudes toward AI evolve over time?
Methodology	Limited experimental and mixed-method research	How do ethical AI practices influence trust, meaningful work, and employee outcomes?

## Implications

This review provides valuable insights for both theoretical and practical considerations in the gradually developing area of Human-AI Collaboration (HAIC). As part of its theoretical contributions to the HAIC literature, this research expands the current understanding of the HAIC literature by moving away from a purely technological performance-based understanding to include human focused aspects such as workplace spirituality, compassion towards AI, trust in AI, and employee well-being as facets of HAIC. By integrating insights from Workplace Spirituality Theory, Human-Centered AI Theory, Digital Psychology, and Compassion Theory (among others), we develop an overarching conceptual framework that provides a mechanism of how individuals acquire meaning, purpose and resilience while working with intelligent technologies. This contribution establishes workplace spirituality as the mediating mechanism by which AI-enabled work environments create positive employee and organizational outcomes; therefore

setting the groundwork for future interdisciplinary studies. In practical terms, our findings suggest organizations should pursue a human centered approach in their implementation of AI technologies. Managers and human resource professionals should consider both technological efficiency as well as creating an environment that fosters trust, psychological safety and well-being in employees. Instances of ethical leadership, transparency in AI systems, creation of a culture of compassion in the workplace and opportunities for personal development and spiritual growth of employees will strengthen the acceptance of AI by employees.

## Conclusion

The results indicate that Human-AI collaboration is influenced by technology and; therefore requires staff to exhibit workplace spirituality and trust in AI whilst also providing compassionate behaviours towards others along with spiritual intelligence in order to produce work which has meaning to their employment,

supports the well-being of employees, supports ongoing organizational resilience and creates sustainable organisational success through HAIC. Although this report contains many elements that have contributed to our understanding of the relationship between human and artificial intelligence within a work environment, this study also has numerous limitations. One limitation was that this review included only peer-reviewed journals written in English; therefore, articles written in other languages or sources may not have been considered. Additionally, the literature dealing with employees collaborating with artificial intelligence and workplace spirituality is still in its infancy and therefore lacks sufficient empirical evidence and theoretical constructs; thus, greater validity for the proposed conceptual framework is required via future empirical, longitudinal, and cross-cultural studies. The Research proposes a conceptual model representing the connections among the technological, psychological and spiritual aspects of an AI-enabled workplace; thus indicating the importance of organisational strategies that focus on Human-Centered AI as well as the promotion of Purpose, Trust and Employee Flourishing in AI-enabled workplaces. In an evolving world of Industry 5.0, Workplace Spirituality is essential to the successful use of technology within organisations and the well-being of humans.

## References

- Ashforth, B. E., & Pratt, M. G. (2003). Institutionalized spirituality: An oxymoron? In R. A. Giacalone & C. L. Jurkiewicz (Eds.), *Handbook of workplace spirituality and organizational performance* (pp. 93–107). M.E. Sharpe.
- Ashmos, D. P., & Duchon, D. (2000). Spirituality at work: A conceptualization and measure. *Journal of Management Inquiry*, 9(2), 134–145. <https://doi.org/10.1177/105649260092008>
- Avolio, B. J., Gardner, W. L., Walumbwa, F. O., Luthans, F., & May, D. R. (2004). Unlocking the mask: A look at the process by which authentic leaders impact follower attitudes and behaviors. *The Leadership Quarterly*, 15(6), 801–823. <https://doi.org/10.1016/j.leaqua.2004.09.003>
- Bakker, A. B., & Demerouti, E. (2007). The Job Demands–Resources model: State of the art. *Journal of Managerial Psychology*, 22(3), 309–328. <https://doi.org/10.1108/02683940710733115>
- Bakker, A. B., & Demerouti, E. (2007). The Job Demands–Resources model: State of the art. *Journal of Managerial Psychology*, 22(3), 309–328. <https://doi.org/10.1108/02683940710733115>
- Bakker, A. B., Albrecht, S. L., & Leiter, M. P. (2011). Key questions regarding work engagement. *European Journal of Work and Organizational Psychology*, 20(1), 4–28. <https://doi.org/10.1080/1359432X.2010.485352>
- Bakker, A. B., Albrecht, S. L., & Leiter, M. P. (2011). Key questions regarding work engagement. *European Journal of Work and Organizational Psychology*, 20(1), 4–28. <https://doi.org/10.1080/1359432X.2010.485352>
- Blau, P. M. (1964). *Exchange and power in social life*. Wiley.
- Brougham, D., & Haar, J. (2018). Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management & Organization*, 24(2), 239–257. <https://doi.org/10.1017/jmo.2016.55>
- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. W.W. Norton & Company.
- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. W.W. Norton & Company.
- Cameron, K. S., Dutton, J. E., & Quinn, R. E. (2003). *Positive organizational scholarship: Foundations of a new discipline*. Berrett-Koehler.
- Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management*, 31(6), 874–900. <https://doi.org/10.1177/0149206305279602>
- Davenport, T. H., & Kirby, J. (2016). *Only humans need apply: Winners and losers in the age of smart machines*. Harper Business.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. [https://doi.org/10.1207/S15327965PLI1104\\_01](https://doi.org/10.1207/S15327965PLI1104_01)
- Deci, E. L., & Ryan, R. M. (2000). The what and why of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. [https://doi.org/10.1207/S15327965PLI1104\\_01](https://doi.org/10.1207/S15327965PLI1104_01)
- Duchon, D., & Plowman, D. A. (2005). Nurturing the spirit at work: Impact on work unit performance. *The Leadership Quarterly*, 16(5), 807–833. <https://doi.org/10.1016/j.leaqua.2005.07.008>
- Dwivedi, Y. K., Hughes, L., Ismagilova, E., et al. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57, 101994. <https://doi.org/10.1016/j.ijinfomgt.2019.08.002>

- Edmondson, A. C. (1999). *Psychological safety and learning behavior in work teams*. *Administrative Science Quarterly*, 44(2), 350–383. <https://doi.org/10.2307/2666999>
- Eisenberger, R., Huntington, R., Hutchison, S., & Sowa, D. (1986). *Perceived organizational support*. *Journal of Applied Psychology*, 71(3), 500–507. <https://doi.org/10.1037/0021-9010.71.3.500>
- Faraj, S., Pachidi, S., & Sayegh, K. (2018). *Working and organizing in the age of artificial intelligence*. *Information and Organization*, 28(1), 62–70. <https://doi.org/10.1016/j.infoandorg.2018.02.007>
- Floridi, L., & Cows, J. (2019). *A unified framework of five principles for AI in society*. *Harvard Data Science Review*, 1(1). <https://doi.org/10.1162/99608f92.8cd550d1>
- Fry, L. W. (2003). *Toward a theory of spiritual leadership*. *The Leadership Quarterly*, 14(6), 693–727. <https://doi.org/10.1016/j.leaqua.2003.09.001>
- Giacalone, R. A., & Jurkiewicz, C. L. (2003). *Handbook of workplace spirituality and organizational performance*. M.E. Sharpe.
- Glikson, E., & Woolley, A. W. (2020). *Human trust in artificial intelligence: Review of empirical research*. *Academy of Management Annals*, 14(2), 627–660. <https://doi.org/10.5465/annals.2018.0057>
- Goleman, D. (1998). *Working with emotional intelligence*. Bantam Books.
- Haenlein, M., & Kaplan, A. (2019). *A brief history of artificial intelligence: On the past, present, and future of artificial intelligence*. *California Management Review*, 61(4), 5–14. <https://doi.org/10.1177/0008125619864925>
- Jarrahi, M. H. (2018). *Artificial intelligence and the future of work: Human–AI symbiosis in organizational decision making*. *Business Horizons*, 61(4), 577–586. <https://doi.org/10.1016/j.bushor.2018.03.007>
- Kahn, W. A. (1990). *Psychological conditions of personal engagement and disengagement at work*. *Academy of Management Journal*, 33(4), 692–724. <https://doi.org/10.2307/256287>
- Kanov, J. M., Maitlis, S., Worline, M. C., Dutton, J. E., Frost, P. J., & Lilius, J. M. (2004). *Compassion in organizational life*. *American Behavioral Scientist*, 47(6), 808–827. <https://doi.org/10.1177/0002764203260211>
- Karakas, F. (2010). *Spirituality and performance in organizations: A literature review*. *Journal of Business Ethics*, 94(1), 89–106. <https://doi.org/10.1007/s10551-009-0251-5>
- Lawande, N., & Venkatesh, S. (2025).
- Lee, M. K. (2018). *Understanding perception of algorithmic decisions: Fairness, trust, and emotion in response to algorithmic management*. *Big Data & Society*, 5(1), 1–16. <https://doi.org/10.1177/2053951718756684>
- Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). *An integrative model of organizational trust*. *Academy of Management Review*, 20(3), 709–734. <https://doi.org/10.5465/amr.1995.9508080335>
- Mesmer-Magnus, J. R., Manapragada, A., Viswesvaran, C., & Allen, J. W. (2017). *Trait mindfulness at work: A meta-analysis of the personal and professional correlates of trait mindfulness*. *Human Performance*, 30(2–3), 79–98. <https://doi.org/10.1080/08959285.2017.1307842>
- Milliman, J., Czaplewski, A. J., & Ferguson, J. (2003). *Workplace spirituality and employee work attitudes*. *Journal of Organizational Change Management*, 16(4), 426–447. <https://doi.org/10.1108/09534810310484172>
- Morrow, E., Zidar, T., Ross, F., Mason, C., Patel, K. D., Ream, M., & Stockley, R. (2023). *Artificial intelligence technologies and compassion in healthcare: A systematic scoping review*. *Frontiers in Psychology*, 13, 971044. <https://doi.org/10.3389/fpsyg.2022.971044>
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press.
- Parker, S. K., & Grote, G. (2022). *Automation, algorithms, and beyond: Why work design matters more than ever in a digital world*. *Applied Psychology*, 71(4), 1171–1204. <https://doi.org/10.1111/apps.12241>
- Paul, J., & Rosado-Serrano, A. (2019). *Gradual internationalization vs born-global/international new venture models*. *International Marketing Review*, 36(6), 830–858.
- Paul, J., Lim, W. M., O’Cass, A., Hao, A. W., & Bresciani, S. (2021). *Scientific procedures and rationales for systematic literature reviews (SPAR-4-SLR)*. *International Journal of Consumer Studies*, 45(4), 01–016. <https://doi.org/10.1111/ijcs.12695>
- Pawar, B. S. (2009). *Workplace spirituality facilitation: A comprehensive model*. *Journal of Business Ethics*, 90(3), 375–386. <https://doi.org/10.1007/s10551-009-0047-7>
- Raisch, S., & Krakowski, S. (2021). *Artificial intelligence and management: The automation–augmentation paradox*. *Academy of Management Review*, 46(1), 192–210. <https://doi.org/10.5465/amr.2018.0072>

- Ryan, R. M., & Deci, E. L. (2001). *On happiness and human potentials: A review of research on hedonic and eudaimonic well-being*. *Annual Review of Psychology*, 52, 141–166. <https://doi.org/10.1146/annurev.psych.52.1.141>
- Seligman, M. E. P. (2011). *Flourish: A visionary new understanding of happiness and well-being*. Free Press.
- Shahid, S., Kaur, K., Mohyuddin, S. M., Prikshat, V., & Patel, P. (2025). *Revolutionizing HRM: A review of human–robot collaboration in HRM functions and the imperative of change readiness*. *Business Process Management Journal*, 31(7), 2892–2928. <https://doi.org/10.1108/BPMJ-12-2023-0951>
- Shneiderman, B. (2022). *Human-centered AI*. Oxford University Press.
- Stahl, B. C. (2021). *Artificial intelligence for a better future: An ecosystem perspective on the ethics of AI and emerging digital technologies*. Springer Nature. <https://doi.org/10.1007/978-3-030-69978-9>
- Tarafdar, M., Cooper, C. L., & Stich, J. F. (2019). *The technostress trifecta: Techno eustress, techno distress, and design*. *Information Systems Journal*, 29(1), 6–42. <https://doi.org/10.1111/isj.12169>
- VanderWeele, T. J. (2017). *On the promotion of human flourishing*. *Proceedings of the National Academy of Sciences*, 114(31), 8148–8156. <https://doi.org/10.1073/pnas.1702996114>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). *User acceptance of information technology: Toward a unified view*. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
- Wagan, M. S., & Sidra, S. (2025). *Artificial intelligence in human resource management: A systematic review of adoption, impact, and challenges*. *AYBU Business Journal*, 5(2). <https://doi.org/10.61725/abj.1786837>
- Walter, Y. (2024). *Digital psychology: Introducing a conceptual impact model and the future of work*. *Trends in Psychology*. <https://doi.org/10.1007/s43076-024-00408-w>
- Waterman, A. S. (1993). *Two conceptions of happiness: Contrasts of personal expressiveness and hedonic enjoyment*. *Journal of Personality and Social Psychology*, 64(4), 678–691. <https://doi.org/10.1037/0022-3514.64.4.678>
- Wilson, H. J., & Daugherty, P. R. (2018). *Collaborative intelligence: Humans and AI are joining forces*. *Harvard Business Review*, 96(4), 114–123.
- Wrzesniewski, A., McCauley, C., Rozin, P., & Schwartz, B. (1997). *Jobs, careers, and callings: People's relations to their work*. *Journal of Research in Personality*, 31(1), 21–33. <https://doi.org/10.1006/jrpe.1997.2162>
- Xu, X., Lu, Y., Vogel-Heuser, B., & Wang, L. (2021). *Industry 4.0 and Industry 5.0—Inception, conception and perception*. *Journal of Manufacturing Systems*, 61, 530–535. <https://doi.org/10.1016/j.jmsy.2021.10.006>

# JIM QUEST

Journal of Management and Technology

## SUBSCRIPTION FORM

Please accept the enclosed cheque/demand draft No \_\_\_\_\_ dated \_\_\_\_\_ drawn on \_\_\_\_\_ bank favouring Jaipuria Institute of Management Ghaziabad for (Rs. \_\_\_\_\_ /US\$ \_\_\_\_\_) towards subscription of JIM QUEST for one/two/three years (Please Tick).

Name: \_\_\_\_\_

Organisation: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

City \_\_\_\_\_ Pin/Zip \_\_\_\_\_ Country \_\_\_\_\_

E-mail: \_\_\_\_\_

### SUBSCRIPTION RATE

#### One Year

##### Print

Institutions: Rs. 2200/-      Individuals: Rs. 1650/-      Overseas: 150 USD

#### Two Year

##### Print

Institutions: Rs. 3900/-      Individuals: Rs. 2800/-      Overseas: 200 USD

#### Three Year

##### Print

Institutions: Rs. 5700/-      Individuals: Rs. 4400/-      Overseas: 250 USD

#### Mail to:

Chief Editor

**JIM QUEST**

**Jaipuria Institute of Management**

Block A, Gate No 2, Shaktikhand IV,

Indirapuram, Ghaziabad

Ph: 0120-4550100

e-mail: [jimquest@jaipuriamba.edu.in](mailto:jimquest@jaipuriamba.edu.in)

Website: [www.jaipuriamba.edu.in](http://www.jaipuriamba.edu.in)

#### Please Note:-

1. The subscription will be from January to December, i.e. for complete set of volumes for one year.
2. Please send Rs. 50 extra for outstation cheque.
3. Any change in address should be informed immediately.
4. The subscription should be sent on the given address.



# Guidelines for Authors

**JIM QUEST** - A peer reviewed journal of Jaipuria Institute of Management invites original research papers, case studies, perspectives and book reviews on themes/issues of current concern in all areas of management and information technology.

*The contributors are requested to adhere to the following guidelines-*

- The selection of papers for publication is based on their originality, knowledge content and application. The journal endeavors to maintain balance between purely research oriented papers and those derived mainly from the experiences of practitioners involved in different areas of management.
- Authors are encouraged to contribute the empirical and analytical research or case research. In case of case studies, contributors are required to provide the teaching notes of the case along with brief description of the real life situation faced and the decision or action taken by the manager or organization. The perspectives need to be based on emerging issues and ideas. The journal encourages the contributors to review the current management books.
- The manuscript should normally not exceed 20 double spaced, single sided typed pages, 12 font size in Times New Roman font, leaving 1.5 inches margin on all sides of A-4 size paper.
- The manuscripts are required to upload on the link- <https://jaipuriamba.edu.in/submit-research-paper>  
The contributions received will be acknowledged immediately by e-mail. The manuscripts not considered for publication will not be sent back. The acceptance or rejection of the contributions will be informed to the contributors through email only. All correspondence should be mailed to [jimquest@jaipuriamba.edu.in](mailto:jimquest@jaipuriamba.edu.in)
- The journal follows a policy of blind peer review.
- The contributors are required to attach a separate title page which should include the title of the paper, name(s) of the author(s) and relevant biographical information. The second page should carry the title of the paper and 100 to 150 word- single paragraph abstract of the paper.
- All tables, charts, and graphs should be black, not in colour. Authors must acknowledge all the sources they have drawn upon and the sources should be indicated at bottom.
- References should be complete in all respects and arranged in alphabetical order as per the standard pattern of research.
- The authors should provide a declaration along with the manuscripts, stating that the article is an original work of author(s) and the same has not been published earlier in any other publication.
- The Editorial board reserves the right to accept or reject any article for publication.
- The authors will receive a complimentary copy of the journal in which their articles are published.





— Accredited 'A' Grade by NAAC —



JAIPURIA INSTITUTE  
OF MANAGEMENT

EMPOWER • ENTHUSE • EXCEL

INDIRAPURAM, GHAZIABAD

— An Autonomous Institution —

# VISION



To become a Fully Integrated, Socially Responsible, Contextually relevant, and Value-Based Management Institute of National Reckoning by meeting the growing and emerging needs of industry and business through contemporary innovative management Teaching, Training, Research and Consulting.

# MISSION



We intend to provide and develop the capabilities of the young managers by raising their level of competence and intellect to face various challenges in the global environment. In pursuit of excellence, we provide training and development services, foster research and disseminate knowledge through publication of books, journals and magazines for the development of society at large.

# QUALITY POLICY



We, at Jaipuria Institute of Management, Ghaziabad dedicate ourselves to providing High Quality education in Management and Software and to promote Indian values, positive attitude & Team Spirit amongst all students, faculty and staff members.

We shall harness latest technological advances & conduct relevant Research & Consultancy to enrich Our education base which will enable participants in solving real life problems scientifically.

We shall strive for continual improvements in all spheres of our activities and maintain Quality Management System within the framework of ISO 9001:2008.

— Accredited “A” Grade by NAAC —



**JAIPURIA INSTITUTE  
OF MANAGEMENT**

**EMPOWER • ENTHUSE • EXCEL**

INDIRAPURAM, GHAZIABAD

— An Autonomous Institution —

Block A, Gate No 2, Shakti Khand IV, Indirapuram,  
Ghaziabad - 201014  
Ph: 0120-4550100

[www.jaipuriamba.edu.in](http://www.jaipuriamba.edu.in)

### **About Jaipuria Institute of Management, Ghaziabad**

Jaipuria Institute of Management is a premier management institute in Ghaziabad set up by Seth Anandram Jaipuria Education Society under the able guidance of the chairman Shri Shishir Jaipuria. JIM offers 2 years state government university master degree courses in business Administration (MBA), MBA Business Analytics and MBA (Banking and Financial Services). All these programs are affiliated with Dr. APJ Abdul Kalam Technical University, Lucknow, UP and approved from AICTE. The institution provides quality management education to transform individuals into Business Leaders, skilled managers and entrepreneurs.

Jaipuria Institute of Management intends to provide and develop the capabilities of the young managers by raising their level of competence and intellect to face various challenges in the global environment. In pursuit of excellence, the institute provides training and development services, fosters research and disseminates knowledge through publication of books, journals and magazines for the development of society at large. Jaipuria Institute of Management has established itself as a leading management institute in northern India.

