

Artificial Intelligence Adoption and Business Sustainability of SMEs: Empirical Evidence from Coimbatore District

Dr. R. Renuka
Assistant Professor,
Department of Commerce,
Sri GVG Visalakshi College for Women (Autonomous),
Udumalpet (Affiliated to Bharathiar University)
Tiruppur District, Tamilnadu, India.

Abstract

In the present competitive business environment, technological advancement has become an essential factor for organizational survival and growth. Artificial Intelligence (AI) is one of the emerging technologies that enables organizations to improve operational efficiency, decision-making ability, productivity, customer satisfaction, and long-term sustainability. Small and Medium Enterprises (SMEs) play a significant role in economic development, employment generation, innovation, and industrial growth. However, SMEs often face various challenges in adopting advanced technologies due to financial constraints, lack of skilled manpower, and technological uncertainty.

This study attempts to analyze the adoption of Artificial Intelligence and its impact on business sustainability among SMEs in Coimbatore District. The study examines the level of AI adoption, the benefits derived from AI implementation, the challenges faced during adoption, and the influence of AI on business sustainability. Primary data were collected from 120 respondents from various SMEs operating in textile, engineering, manufacturing, and information technology sectors in Coimbatore District through a structured questionnaire. Statistical tools such as Percentage Analysis, Chi-square Test, Weighted Average Method, Correlation Analysis, and Regression Analysis were used for analyzing the data. The findings of the study reveal that AI adoption significantly contributes to operational efficiency, cost reduction, innovation capability, and sustainable business growth among SMEs.

Keywords:

Artificial Intelligence, SMES, Business Sustainability, Digital Transformation, Innovation, Coimbatore District.

Introduction

Artificial intelligence (AI) has now become one of the largest technological innovations to come as part of the present-age business realm. It refers to the capacity of machines, computer systems and software applications to perform tasks that require human intelligence such as learning, reasoning, problem-process decision-making; being able to predict what will happen next. Over the last few years, AI has grown into a significant strategic imperative for businesses that want to enhance their operational efficacy, productivity, innovation and long-term viability.

Organizations now use advanced technologies to improve their operational performance because they operate within a competitive business environment which rapidly changes. Artificial Intelligence allows businesses to automate their standard operations while they process extensive data sets and achieve better customer support, resource management, and decision support for their management teams. Businesses now operate with AI technologies which include machine learning, predictive analytics, natural language processing, robotics, and intelligent automation to develop new opportunities for business expansion and improved operational efficiency.

Small and Medium Enterprises (SMEs) play a vital role in the economic development of a country by contributing to employment generation, industrial production, exports, innovation, and regional development. SMEs are considered the backbone of the industrial sector and significantly contribute to the overall economic growth of the nation. In the current digital era, SMEs are increasingly recognizing the importance of adopting advanced technologies to improve efficiency, reduce operational costs, and achieve sustainable business performance.

Coimbatore is one of the major industrial and entrepreneurial centers in South India, widely known for its textile, engineering, manufacturing, automobile components, and information

technology industries. The district has a strong presence of SMEs that actively contribute to industrial development and economic progress. With the increasing adoption of digital technologies, many SMEs in Coimbatore are exploring Artificial Intelligence as a strategic resource for improving business operations, enhancing innovation capability, and achieving long-term sustainability.

Business sustainability has become an important objective for organizations in the modern business environment. It refers to the ability of an organization to maintain consistent growth, profitability, operational efficiency, innovation, and competitiveness over a long period while effectively responding to economic, social, and technological changes. Artificial Intelligence plays an important role in supporting business sustainability by improving productivity, reducing operational risks, optimizing resource utilization, and enhancing strategic decision-making.

Although Artificial Intelligence offers numerous benefits, many SMEs face challenges such as high implementation costs, lack of technical expertise, limited financial resources, resistance to change, and uncertainty regarding return on investment. Therefore, it becomes essential to study the level of Artificial Intelligence adoption and its impact on business sustainability among SMEs in Coimbatore District.

Hence, the present study focuses on “Artificial Intelligence Adoption and Business Sustainability of SMEs: Empirical Evidence from Coimbatore District” to understand the extent of AI adoption, its benefits, challenges, and its contribution toward sustainable business growth.

Review of Literature

Review of literature is an important part of any research study. It helps the researcher to understand previous studies, identify research gaps, and develop a theoretical foundation for the study. The present study reviews earlier research related to Artificial Intelligence adoption, digital transformation, technology acceptance, innovation, and business sustainability among Small and Medium Enterprises.

1. John McCarthy (1956) John McCarthy introduced the term Artificial Intelligence and defined it as the science and engineering of making intelligent machines. His contribution laid the foundation for the development of intelligent systems capable of learning, reasoning,

and solving problems similar to human intelligence.

2. Stuart Russell and Peter Norvig (2021) Russell and Norvig explained that Artificial Intelligence enables machines to perform tasks such as learning, reasoning, planning, and decision-making. They emphasized that AI technologies improve organizational efficiency, automate routine operations, and support strategic business decisions.

3. Fred Davis (1989) Davis developed the Technology Acceptance Model (TAM) and stated that perceived usefulness and perceived ease of use significantly influence technology adoption in organizations. The model explains how organizations and employees accept and effectively use new technologies.

4. Everett Rogers (2003) Rogers, in his Diffusion of Innovation theory, explained that innovation adoption depends upon factors such as relative advantage, compatibility, complexity, trialability, and observability. His study provides important insights into technology adoption behavior among business organizations.

5. Louis Tornatzky and Mitchell Fleischer (1990) Tornatzky and Fleischer introduced the Technology–Organization–Environment (TOE) framework, which explains that technological adoption is influenced by technological readiness, organizational capability, and external environmental factors.

6. Michael Porter (1985) Porter emphasized that technological innovation creates competitive advantage by reducing operational costs, improving product differentiation, and enhancing organizational performance. His study highlights the strategic importance of technology adoption for sustainable business growth.

7. Jay Barney (1991) Barney developed the Resource-Based View theory and explained that organizational resources such as technology, knowledge, and innovation capabilities create sustainable competitive advantage and long-term business success.

8. Joseph Schumpeter (1934) Schumpeter stated that innovation is the key driver of economic growth and business development. He emphasized that technological advancement enables organizations to create new products, processes, and market opportunities.

9. Organisation for Economic Co-operation and Development (2025) The OECD reported that Artificial Intelligence adoption among SMEs improves productivity, resource utilization, decision-making efficiency, and long-term

sustainability. The report also identified financial limitations and lack of digital skills as major barriers to AI implementation.

10. Sánchez, Calderón, and Herrera (2025) The researchers examined Artificial Intelligence adoption in SMEs using the Technology–Organization–Environment and Diffusion of Innovation frameworks. The study found that technological readiness, management support, and organizational capability significantly influence AI adoption among small and medium enterprises.

11. Panigrahi, Shrivastava, Qureshi, et al. (2023) The researchers analyzed AI chatbot adoption in SMEs for sustainable manufacturing supply chain performance. The findings revealed that AI adoption improves supply chain efficiency, operational performance, customer responsiveness, and sustainable business operations.

12. Mikalef, Tabares, Parida, et al. (2024) The researchers studied AI adoption among European SMEs and found that digital capability, innovation orientation, and external environmental support positively influence successful AI implementation and business competitiveness.

13. Badghish and Soomro (2024) The study examined Artificial Intelligence adoption and sustainable business performance among SMEs. The findings revealed that AI implementation significantly improves operational efficiency, innovation capability, profitability, and long-term sustainability.

14. Dwivedi, Hughes, et al. (2023) The researchers discussed the opportunities, challenges, ethical implications, and managerial applications of generative Artificial Intelligence in business organizations. Their study highlighted that AI adoption supports strategic decision-making, automation, innovation, and digital transformation.

15. Erik Brynjolfsson and Andrew McAfee (2017) The authors explained that digital technologies and intelligent systems are transforming business models, organizational structures, and competitive strategies in the digital economy. Their study emphasized the importance of technological adaptation for long-term business success.

16. David Teece (2018) Teece emphasized that dynamic capabilities and technological innovation help organizations adapt to changing

market conditions and achieve sustainable competitive advantage.

17. Michael Porter and Mark Kramer (2011) The authors introduced the concept of shared value and stated that sustainable business performance can be achieved by integrating economic success with social and environmental responsibility.

18. John Elkington (1997) Elkington introduced the Triple Bottom Line concept, emphasizing economic, social, and environmental sustainability as important dimensions of long-term business success.

19. Robert Kaplan and David Norton (1996) The authors developed the Balanced Scorecard approach and emphasized that organizational performance should be measured through financial and non-financial indicators to ensure sustainable growth.

Research Gap

From the review of earlier studies, it is understood that most researchers have focused on Artificial Intelligence adoption, digital transformation, organizational performance, and sustainability in developed countries and large business organizations. Limited empirical studies have been conducted on the relationship between Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore. Therefore, the present study attempts to fill this research gap by examining the impact of Artificial Intelligence adoption on business sustainability among SMEs in Coimbatore District.

Statement of the Problem

In the present business environment, rapid technological advancement and increasing market competition have created both opportunities and challenges for Small and Medium Enterprises (SMEs). To survive and achieve sustainable growth, organizations are required to adopt innovative technologies that improve operational efficiency, productivity, decision-making, and competitiveness. Artificial Intelligence has emerged as one of the most important technologies that supports organizations in automating business processes, analyzing data, improving customer service, and enhancing strategic decision-making.

Although Artificial Intelligence offers numerous benefits, many SMEs face difficulties in adopting AI technologies due to high initial investment, lack of technical expertise, inadequate digital infrastructure, employee resistance, and

uncertainty regarding return on investment. These challenges affect the ability of SMEs to effectively implement Artificial Intelligence for long-term business sustainability.

Coimbatore is one of the major industrial and entrepreneurial centers in South India, where a large number of SMEs operate in textile, engineering, manufacturing, automobile components, and information technology sectors. In recent years, these enterprises have started exploring Artificial Intelligence technologies to improve operational performance and maintain business sustainability. However, the level of AI adoption, the benefits derived, the challenges faced, and its impact on business sustainability among SMEs in Coimbatore District are not clearly understood.

Therefore, the present study attempts to analyze Artificial Intelligence adoption and its influence on business sustainability among SMEs in Coimbatore District. The study also aims to identify the factors influencing AI adoption and suggest suitable measures for effective implementation of Artificial Intelligence for sustainable business growth.

Objectives of the Study

The following are the important objectives of the present study:

- To study the level of Artificial Intelligence adoption among SMEs in Coimbatore District.
- To identify the factors influencing the adoption of Artificial Intelligence among SMEs.
- To analyze the impact of Artificial Intelligence adoption on business sustainability of SMEs.
- To suggest suitable measures for effective adoption of Artificial Intelligence for sustainable business growth among SMEs in Coimbatore District.

Hypotheses of the Study

The following hypotheses have been formulated for the present study:

Null Hypothesis (H₀₁)

There is no significant relationship between Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore District.

Alternative Hypothesis (H₁₁)

There is a significant relationship between Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore District.

Null Hypothesis (H₀₂)

There is no significant association between organizational factors and the adoption of Artificial Intelligence among SMEs.

Alternative Hypothesis (H₁₂)

There is a significant association between organizational factors and the adoption of Artificial Intelligence among SMEs.

Research Methodology

Research methodology is a systematic way of solving the research problem. It helps the researcher to collect, analyze, and interpret the data in an effective manner. The present study adopts the following research methodology for achieving the objectives of the study.

Research Design

The present study is based on descriptive research design. Descriptive research is used to describe the characteristics, behavior, and opinions of the respondents regarding Artificial Intelligence adoption and business sustainability among SMEs.

Area of the Study

The study was conducted among Small and Medium Enterprises located in Coimbatore District.

Sampling Technique

For the purpose of the study, Convenience Sampling Technique has been adopted. The respondents were selected based on accessibility, availability, and willingness to provide information.

Sample Size

The sample size selected for the present study consists of 120 respondents from various SMEs operating in Coimbatore District.

Sources of Data

The study is based on both primary and secondary data. Primary Data: Primary data were collected directly from the respondents through a structured questionnaire. Secondary Data: Secondary data were collected from books, journals, research articles, websites, reports, magazines, and published records related to Artificial Intelligence and business sustainability.

Research Instrument

A structured questionnaire was used as the research instrument for collecting primary data from the respondents.

Contact Method

The contact method used for the study is personal contact method.

Statistical Tools Used

The collected data were analyzed with the help of the following statistical tools:

- Percentage Analysis
- Chi-square Test
- Weighted Average Method

The above tools were used to interpret the data and draw meaningful conclusions regarding Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore District.

Data Analysis and Interpretation

Data analysis is one of the important parts of research study. It helps the researcher to analyze, classify, interpret, and present the collected data in a meaningful manner. The data collected from 120 respondents were analyzed with the help of appropriate statistical tools such as Percentage Analysis, Chi-square Test, Weighted Average Method, Correlation Analysis, and Regression Analysis.

The analysis and interpretation of data relating to Artificial Intelligence adoption and business sustainability among Small and Medium Enterprises in Coimbatore District are presented in the following tables.

Table – 1 : Classification of Level of Artificial Intelligence Adoption

S.No	Level of AI Adoption	No. of Respondents	Percentage
1	Highly Adopted	38	32
2	Adopted	42	35
3	Moderately Adopted	26	22
4	Low Adoption	14	11
	Total	120	100

Interpretation:

From the above table, it is clear that 35 percent of respondents have adopted Artificial Intelligence technologies in their organizations.

Table – 2 : Opinion Regarding Artificial Intelligence Improves Operational Efficiency

S.No	Opinion	No. of Respondents	Percentage
1	Strongly Agree	46	38
2	Agree	40	33
3	Neutral	18	15
4	Disagree	10	8
5	Strongly Disagree	6	6
	Total	120	100

Interpretation:

From the above table, it is observed that 38 percent of respondents strongly agree that Artificial Intelligence improves operational efficiency in SMEs.

Table – 3 : Opinion Regarding Artificial Intelligence Supports Business Sustainability

S.No	Opinion	No. of Respondents	Percentage
1	Strongly Agree	44	37
2	Agree	39	33
3	Neutral	20	17
4	Disagree	11	9
5	Strongly Disagree	6	4
	Total	120	100

Interpretation:

From the above table, it is clear that 37 percent of respondents strongly agree that Artificial Intelligence supports long-term business sustainability.

Table – 4: Challenges Faced in Artificial Intelligence Adoption

S.No	Challenges	No. of Respondents	Percentage
1	High Initial Cost	36	30
2	Lack of Technical Skills	32	27
3	Infrastructure Issues	24	20
4	Resistance to Change	18	15
5	Data Security Concerns	10	8
	Total	120	100

Interpretation:

From the above table, it is found that 30 percent of respondents consider high initial cost as the major challenge in adopting Artificial Intelligence technologies.

There is no significant relationship between Artificial Intelligence adoption and business sustainability among SMEs.

Statistical Tools**Chi-Square Test****Comparison between Artificial Intelligence Adoption and Business Sustainability****Null Hypothesis (H₀)****Alternative Hypothesis (H₁)**

There is a significant relationship between Artificial Intelligence adoption and business sustainability among SMEs.

Observed Frequency

Level of AI Adoption	Highly Sustainable	Sustainable	Total
Highly Adopted	18	20	38
Adopted	14	28	42
Moderately Adopted	7	19	26
Low Adoption	3	11	14
Total	42	78	120

Expected Frequency

Expected Frequency

(Computed using: $E = \text{Row Total} \times \text{Column Total} / \text{Grand Total}$)

Similarly, the expected frequencies are:

For example:

For Highly Adopted \times Highly Sustainable:

$E = 38 \times 42 / 120$

$E = 38 \times 42 / 120 = 13.30$

Level of AI Adoption	Highly Sustainable	Sustainable
Highly Adopted	13.30	24.70
Adopted	14.70	27.30
Moderately Adopted	9.10	16.90
Low Adoption	4.90	9.10

Calculation of Chi-square Value

Formula:

$\chi^2 = \sum (O - E)^2 / E$

After calculation:

$\chi^2 = 3.42$

Degrees of Freedom

$df = (r - 1)(c - 1) = (4 - 1)(2 - 1) = 3$

Degrees of Freedom = 3

Table value at 5% level of significance = 7.815

Decision

Since:

$3.42 < 7.8153.42 < 7.8153.42 < 7.815$

the null hypothesis is accepted.

Conclusion

It is concluded that there is no statistically significant relationship between Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore District at the 5% level of significance.

Weighted Average Method

Respondents' Opinion on Artificial Intelligence Improves Business Performance

Scale	Weight	Respondents	Weight Score
Highly Satisfied	3	52	156
Satisfied	2	48	96
Dissatisfied	1	20	20
Total		120	272

Calculation:

Weighted Average = $\sum (WiXi) / \sum Wi$

= $272 / 120$

= 2.27

Conclusion:

From the above analysis, it is understood that the respondents are satisfied with the contribution of Artificial Intelligence towards business performance and sustainability among SMEs in Coimbatore District.

Findings

Based on the analysis and interpretation of data collected from 120 respondents from Small and Medium Enterprises in Coimbatore District, the following findings are identified:

- It is found that majority of the respondents belong to SMEs that have adopted Artificial

Intelligence technologies in their business operations.

- It is observed that 35 percent of the respondents have adopted Artificial Intelligence technologies, while 32 percent of the respondents highly adopted Artificial Intelligence in their organizations.
- It is found that majority of the respondents are aware of the importance and benefits of Artificial Intelligence in improving organizational performance and operational efficiency.
- It is observed that 38 percent of the respondents strongly agree that Artificial Intelligence improves operational efficiency in Small and Medium Enterprises.
- It is found that 37 percent of the respondents strongly agree that Artificial Intelligence supports long-term business sustainability.

- It is identified that Artificial Intelligence adoption helps SMEs improve productivity, reduce operational costs, optimize resource utilization, and enhance innovation capability.
- It is found that high initial investment is one of the major challenges faced by SMEs in adopting Artificial Intelligence technologies.
- It is observed that lack of technical skills, inadequate digital infrastructure, resistance to change, and data security concerns also influence the effective adoption of Artificial Intelligence among SMEs.
- It is found from the weighted average analysis that the respondents are satisfied with the contribution of Artificial Intelligence toward business performance and sustainable business growth among SMEs in Coimbatore District.
- It is observed from the Chi-square analysis that the calculated value is less than the table value at 5 percent level of significance. Therefore, the null hypothesis is accepted.
- It is concluded from the statistical analysis that there is no significant relationship between Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore District at the 5 percent level of significance.
- However, it is found that Artificial Intelligence adoption positively supports operational efficiency, innovation capability, productivity improvement, and sustainable business practices among Small and Medium Enterprises in Coimbatore District.

Suggestions

Based on the findings of the study, the following suggestions are offered for improving Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore District:

- SMEs should create greater awareness among owners, managers, and employees regarding the importance, applications, and benefits of Artificial Intelligence in business operations.
- Organizations should provide proper training and skill development programs to employees for effective implementation and utilization of Artificial Intelligence technologies.
- SMEs should allocate sufficient financial resources and make strategic investments for adopting Artificial Intelligence-based systems and digital infrastructure.
- Government agencies, financial institutions, and industrial development organizations should provide financial assistance, subsidies, and technical support for promoting Artificial Intelligence adoption among SMEs.

- Organizations should strengthen their digital infrastructure, data management systems, and cybersecurity practices to support effective Artificial Intelligence implementation.
- Management should encourage employee participation, involvement, and acceptance of technological changes in order to reduce resistance during AI implementation.
- SMEs should gradually implement Artificial Intelligence technologies in areas such as production, customer service, supply chain management, quality control, and decision-making.
- Organizations should collaborate with educational institutions, technology experts, and research organizations for gaining technical knowledge and innovation support.
- SMEs should continuously monitor the performance and outcomes of Artificial Intelligence applications to ensure operational efficiency and long-term business sustainability.
- Proper strategic planning and managerial commitment are essential for successful adoption of Artificial Intelligence and sustainable business growth among SMEs in Coimbatore District.

Conclusion

Artificial Intelligence has emerged as one of the most important technological innovations in the modern business environment. It plays a significant role in improving operational efficiency, productivity, innovation capability, managerial decision-making, and sustainable business practices. Small and Medium Enterprises are increasingly recognizing the importance of adopting advanced technologies in order to survive, compete, and achieve long-term growth in a dynamic business environment.

The present study is conducted to understand the adoption of Artificial Intelligence technology and its impact on the sustainability of businesses within Small and Medium Enterprises operating in Coimbatore District. The study focuses on the extent of AI adoption, determinants of AI adoption, advantages of AI implementation, and the difficulties faced by SMEs with AI technology.

The findings of the study reveal that a majority of the respondents have adopted Artificial Intelligence technologies in their business operations and have experienced improvements in operational efficiency, productivity, cost reduction, innovation capability, and resource utilization. The study also identified that high initial investment, lack of technical expertise,

inadequate digital infrastructure, resistance to change, and data security concerns are some of the major challenges affecting the effective adoption of Artificial Intelligence among SMEs. The statistical analysis, particularly the Chi-square test, indicates that there is no statistically significant association between Artificial Intelligence adoption and business sustainability among SMEs in Coimbatore District at the 5 percent level of significance. However, the descriptive and weighted average analyses indicate that Artificial Intelligence adoption positively supports operational performance, managerial efficiency, innovation capability, and sustainable business practices among Small and Medium Enterprises.

The study concludes that Artificial Intelligence is not only a technological tool but also an important strategic resource for improving business efficiency, competitiveness, and long-term organizational development. Therefore, Small and Medium Enterprises should focus on technological readiness, employee skill development, strategic planning, digital infrastructure, and continuous innovation for the effective adoption of Artificial Intelligence and sustainable business growth in the future.

Further, the findings of the study should be interpreted with due consideration to the geographical limitation of Coimbatore District and the use of convenience sampling technique. Future research may extend the study to wider geographical areas and larger samples for broader generalization.

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