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AI Adoption as a Driver of Sustainable Development in Assam's Startup Ecosystem

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Abstract

Assam, one of the major states in Northeast India, is the major startup ecosystem in the region and produces a large share of the total of the Northeast region, with more than 2,000 ventures. Government efforts support this further expansion with an AI-First program of skilling, governance, and business. The sectors emphasized in programs include agrotech, health tech, clean energy, aligning with AI-driven solutions for resource efficiency, precision agriculture, inclusive development which are co-evolving with national Sustainable Development Goals (SDGs). Nonetheless, unresolved issues such as lack of digital infrastructure and skills deficit highlight necessity to investigate role of AI in enhancing sustainability of startups and regional economic development. Purpose:"To study the role of AI adoption in the startup sustainability and economic growth of the Assam startup ecosystem, and the determinants of sustainable development that accumulate due to the adoption of AI". Methodology: Quantitative research design has been adopted based on primary data using structured questionnaire of 350 founders of startups in different districts of Assam. Statistical tests have been performed using SPSS software to analyse data by descriptive statistics, Pearson correlation analysis, one-way ANOVA. Findings: The analysis of statistics indicated that utilization of AI and factors which promote sustainable development are extremely beneficial in startups located in Assam. The data also shows that startup owners in different parts of Assam have similar views on AI solutions. This shows that AI technologies are important for entrepreneurial growth. Yet, these outcomes have been contradicted by regional variables, namely obstacles such as infrastructural shortcomings and competencies. Implications: Its results demonstrate importance of use of AI to accelerate process of sustainable development in region like Assam region, based on state policies and national goals. It highlights role of policy measures that focus on enhancement of digital infrastructure and financial support of technology-driven startups to enhance sustainability in Assam.

***Keywords**: AI Adoption, Assam, Entrepreneurial Development, Sustainability, Startups.*

Introduction

The startup ecosystem in India has experienced a surge in modification in the past ten years because of acceleration of the digitalization process, policy-induced innovation, and increased usage of the newest scientific tools like artificial intelligence (AI). (Rroy& Devi, 2025). The national programs on entrepreneurship, digital governance, and innovation-led growth have reinforced the platform of technology-enabled startups throughout the nation (Kumar, 2025; Sarkar, 2025). In this changing context, Assam has become one of the promising growth drivers of the startup of the Northeast region, and businesses are going to be established in various industries, including agritech, healthcare, education,

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tourism, handicraft, and information technology (Banik and Sinha, 2021).These businesses are outstanding samples of heterogeneity of socio-economic regions and deliver chances for sustainable development based on technologies.

A strategicizable concept of AI is coming to take place as means for companies to be competitive in market, be efficient, be more resilient in long run. AI-first and innovation policies of governments have motivated startups to adopt AI in decision-making, optimizing operations, enhance efficiency (Momaya, 2022). Smart supply-chain management, predictive analytics, automation, data-driven marketing are some AI-based methods which can help startups to handle market uncertainty and optimise their resources. Such skills are particularly applicable in regions such as Assam where startups are frequently required to follow rules regarding geography, structure, market access. It will assist in precision farming, enhanced healthcare, digital access (conform to SDGs aiming at economic growth, equity, environmental stewardship) (Sreenivasan & Suresh, 2022). However, application of AI is not equally applied to newer and heterogenous ecosystems. As empirical research indicates, infrastructural shortages, limited avenues to talent specialisation in AI, high initial investment needs, and unequal levels of digital penetration play a large role in determining AI adoption among startups (Sasidharan and Alora, 2025).

Nevertheless, there is reason to believe that even the limited amounts of AI implementation can result in practical gains in the form of productivity, cost-saving, and competitiveness, particularly in the case of small & medium enterprises that have to work with limited resources (Roy and Shakya, 2025).Also, inclusive entrepreneurship outcomes associated with AI-driven practices include better participation of women entrepreneurs and extra sustainable human resource practices (Roy and Shakya, 2025).

It is on this basis that AI adoption must be considered within prism of sustainability. Old industries and new technologies collide fatally in Assam where distinct startup environment is present. One can also find data on potential uses of AI in assisting areas to deal with specific issues. The proposed study will analytically observe association between AI adoption and drivers of sustainable development among startups in Assam based on ecosystem variables. In this regard, this contributes to emerging literature on AI-based entrepreneurship plus sustainable development in evolving regional ecosystems.

Statement of the Problem

However, regardless of increasing significance of AI in enhancing strategy of innovation in startup sector, its uptake in various regional contexts is heterogeneous. In developing region like Assam, startups may receive inadequate technological infrastructure, scarcity of skilled human resources, financial limitations, which may hinder integration of AI in business. Prior studies demonstrated significance of AI in promoting sustainability in highly advanced technological sectors; however, research emphasizing association between AI adoption and sustainable development in startup ecosystem in Northeast India is limited. Consequently, this is indispensable to examine impact of AI adoption on sustainability among startups in Assam.

Objectives of the Study

- To examine the relationship between AI adoption and sustainable development drivers among startups in Assam.
- To analyse whether perceptions of AI-driven sustainability differ across demographic and operational categories of startups.

Literature Review

The convergence of AI, entrepreneurship, and sustainable development has received growing academic attention over the past several years. According to studies on startup ecosystems, AI is an innovative and disruptive capability that increases innovation, competitiveness, and long-term sustainability. Sreenivasan and Suresh (2022) note that the usage of AI in startups enhances the accuracy of the decisions made, operative efficacy, and scalability, especially in startups. Equally, Sasidharan and Alora (2025) opine that AI is an agent of growth by facilitating an approach based on data and business models that are flexible. Banik and Sinha (2021) identify digital technologies as platform enablers, which facilitate long-term ventures and empower entrepreneurial ecosystems in the Indian context.

The research on sustainability puts AI into perspective more and more as a means of attaining environmental and social goals along with economic success. Hwang et al. (2025) reveal the dynamics of co-creation using AI in the context of the circular economy to make the startups viable as it is possible to achieve profitability and environmental responsibility. Jorzik et al. (2024) also indicate that AI business model innovation is vital to green technology startups because it promotes the use of resources efficiently and minimizes ecological footprint. Supporting this view, Ansari et al. (2025) mention AI-assisted circular strategies as important mechanisms of sustainable technological advances in the sphere of startup ecosystems.

Ecosystem and policy-wise, Momaya (2022) and Kumar (2025) also emphasize that favourable institutional structures, digital infrastructure, and innovation policies are useful in facilitating startups to take advantage of AI. According to Sarkar (2025), as the number of opportunities to invest in AIs and become an entrepreneur in India grows thanks to the efforts of the government, obstacles that relate to funding access and skill acquisition remain. On the global scale, Kowal and Przewoźnik (2025) demonstrate that deep-tech ecosystem becomes a catalyst of sustainable development, which supports the relevance of ecosystem maturity in the results of AI adoption.

The theory of dynamic capabilities also describes how AI helps startups to survive in unstable environments. According to Cimino et al. (2025), AI enhances sensing, seizing, and reconfiguring capabilities, which help startups to succeed during disruption.

Lastly, AI contribution to environmental issues and development of green innovation is also explored within framework of sustainable entrepreneurship (Sharma, 2025; Islam, 2024). Overall, it can be seen that AI implementation can be extremely influential on sustainability of startups and requires consideration of key factors, including level of ecosystem development; hence, literature on AI-based research on Assam is even urgent and critical.

The existingwork is grounded on Dynamic Capability Theory, which highlights ways in which businesses enhance their capacity to adapt and respond to evolving business world (Teece, 2007). Startups perform in situations that change rapidly due to advanced technologies. Adopting new technologies is strategic tool to plan for long-term growth. AI is a technology that improves diverse aspects of startups. Startups could use AI to evaluate market opportunities, technical advantages, potential threats to deal with market unpredictability. In developing areas like Assam, where startups often have difficulty with infrastructure and financial utilizations, using AI could help environment by encouraging sustainable development. Dynamic Capability Theory thus offers anapttheoreticoutline for examining impact of AI adoption on sustainable development within the startup domain of Assam. Despite the theoretical importance of Dynamic Capability Theory in highlighting use of technology and adaptability by firms, research assessing influence of AI on sustainable development in regional ecosystems such as Assam is scarce.

Research Gap

It is projected that AI is a transformative skill, which improves innovation and sustainability of modern business. Several researches have shown that AI can improve performance of startups and facilitate sustainability within businesses, especially within scientific development sectors and major metropolitan cities. According to numerous studies, AI-based startups have better digital infrastructure, financial accessibility, different technical expertise. Nevertheless, there has been inadequate study on AI-based startups in region-specific ecosystems, especially in resource-constrained regions. Most investigations in India concentrate on AI implementation and long-term success of businesses in metropolitan cities of country. The northeast of India, Assam in particular, is a section which has not been explored thoroughly, yet it has experienced increase in economic activity and dynamic startup ecosystem. Diverse geographical characteristics, limited infrastructure conditions, dynamic digital scene of Assam generate different environment to analyse role of AI in enhancing sustainable startup development. This study purposes to address research gap by analyzing how AI adoption facilitates sustainable growth within Assam's changing startup culture.

- **Conceptual Framework**

The conceptual framework of the current study informed by Dynamic Capability Theory observes the association amongst AI adoption and sustainable development in Assam's startup sector. AI adoption is measured as one of the chief aspect that can improve the resource optimisation, marketplace probability as well as continuing sustainability of startups. Based on this view, the study

offers that increased AI usage amongst the startups may have a favourable effect on sustainable development outcomes for instance fiscal stability plus long-term business growth. Consequently, AI adoption is assumed as the independent variable, while sustainable development drivers represent the dependent variables in this work. Moreover, AI adoption leads to environmental sustainability by permitting energy efficiency and resource optimisation.

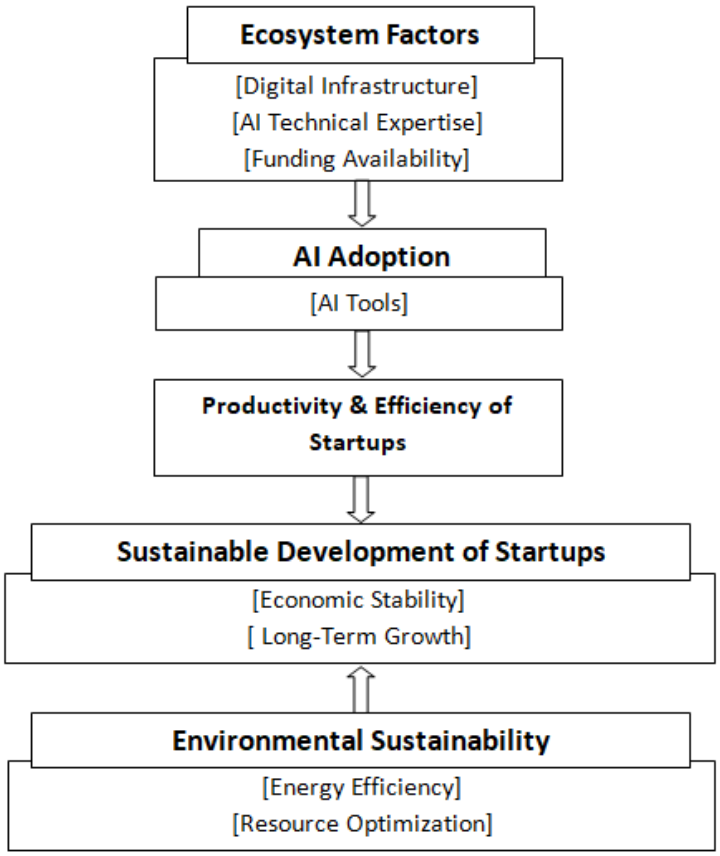


Fig. 3.1: Conceptual Framework of AI Adoption and Sustainable Development

- **Hypothesis Development**

Former research-works have discovered that AI boosts long-term sustainability in establishments. (Sasidharan and Alora, 2025).According to the conceptual framework and the existing literature, the current research work suggests following hypotheses to study the association between AI adoption and sustainable development among startups in Assam:

H1: *Artificial Intelligence adoption has a significant positive impact on the sustainable development of startups in Assam.*

H2: *Artificial Intelligence adoption significantly improves operational efficiency in startups.*

H3: *Operational efficiency positively influences the sustainable development of startups.*

H4: *Artificial Intelligence adoption enhances environmental sustainability.*

- **Research Methodology**

The study adopts a quantitative research design for assessing the association between AI adoption and sustainable development in Assam's startup sector. The research employed Purposive Sampling Technique to determine startup founders in Assam. The primary data has been collected through standardized questionnaire presented to the founders of startups in Assam involved with AI sectors such as clean energy, health technology, agricultural technology. The questionnaire has been circulated by email to founders of startups in state from January to March 2026. The questionnaire had

Likert-scale questions regarding probability of AI being adopted, its effects on sustainability, the problems AI might cause, and future, demographic characteristics. We used a five-point Likert scale to record all of our answers, with 1 being "Strongly Disagree" and 5 being "Strongly Agree." Seven objects modified from prior research on implementing technology in startups were utilized to evaluate AI acceptability. Out of 400 questionnaires distributed, 350 startups from Assam participated in survey. SPSS statistical software was used to analyse composite data. Descriptive statistics have been employed to analyze respondent characteristics and levels of AI usage. We used Pearson correlation analysis to investigate association between AI adoption and sustainable development variables. A one-way ANOVA has been used to analyze variance in insights from different parts of Assam. Cronbach's Alpha has been used to ensure that quantity scale was reliable. Cronbach's Alpha has been used to determine how consistent the items in the structured questionnaire were. This showed that internal consistency was satisfactory.

- **Data Analysis**

The data was analysed in SPSS on 350 operating startups in Assam. The analysis involves demographic profiling, Likert scale distribution, correlation analysis, and one-way ANOVA, which are in tandem with the study objectives.

Demographic Profile of Respondents

- **Location of Business Operations in Assam**

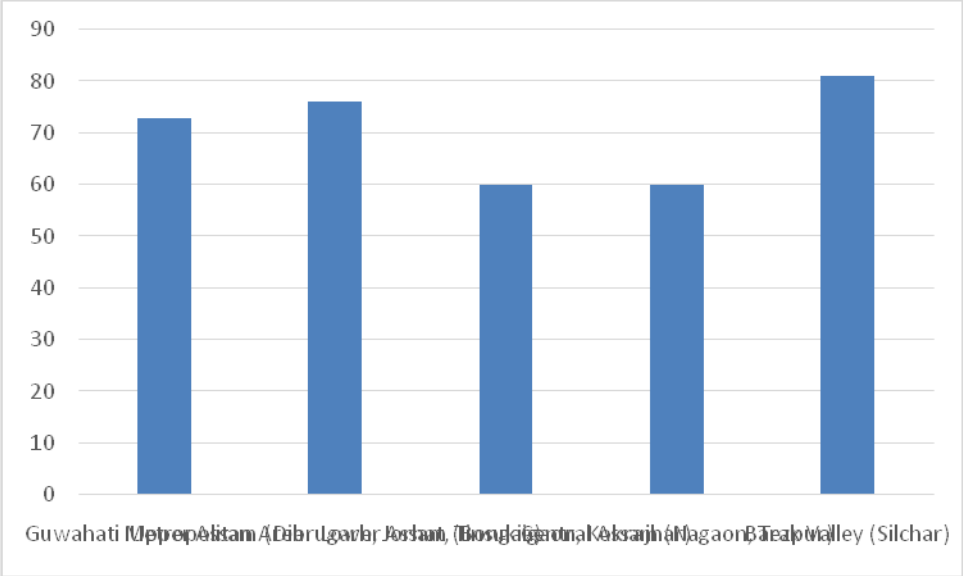


Fig. 6.1: Graphical Representation of Location of Business Operations in Assam

Table 1: Location of Business Operations in Assam

Location of Business Operations	Frequency	Percent	Valid Percent	Cumulative Percent
Guwahati Metropolitan Area	73	20.9	20.9	20.9
Upper Assam (Dibrugarh, Jorhat, Tinsukia)	76	21.7	21.7	42.6
Lower Assam (Bongaigaon, Kokrajhar)	60	17.1	17.1	59.7
Central Assam (Nagaon, Tezpur)	60	17.1	17.1	76.9
Barak Valley (Silchar)	81	23.1	23.1	100.0
Total	**350**	**100.0**	**100.0**	

The respondents are evenly spread throughout Assam, with the highest percentage (23.1%) in the Barak Valley, then Upper Assam (21.7%) and Guwahati Metropolitan Area (20.9%). This homogenous distribution of the region reinforces the representativeness of the given study and shows that both urban and semi-urban startup clusters are using AI adoption and sustainability issues in Assam.

- **Current Usage of AI Tools**

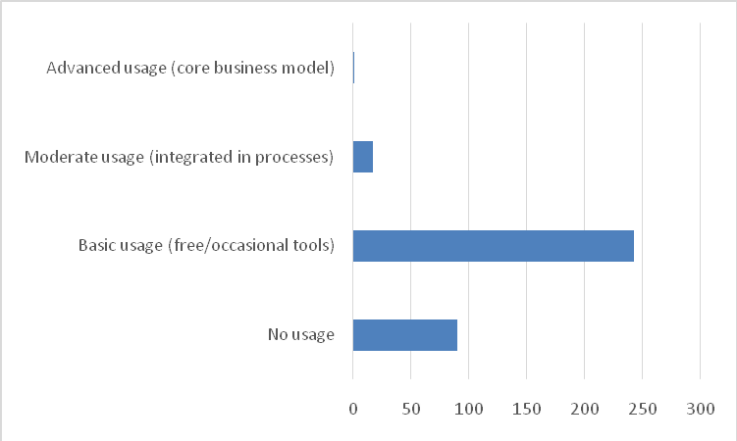


Fig. 6.2: Graphical Representation of Current Usage of AI Tools

Table 2: Current Usage of AI Tools

Level of AI Usage	Frequency	Percent	Valid Percent	Cumulative Percent
No usage	90	25.7	25.7	25.7
Basic usage (free/occasional tools)	242	69.1	69.1	94.9
Moderate usage (integrated in processes)	17	4.9	4.9	99.7
Advanced usage (core business model)	1	0.3	0.3	100.0
Total	**350**	**100.0**	**100.0**	

Of the startups, a considerable part (69.1%) utilises basic AI, and only 5.2% exhibits moderate and advanced integration. It indicates that despite the prevalence of awareness and experimentation of AI, the integration of AI is in its early stages within the Assam startup ecosystem.

Analysis of AI & Sustainability

- **Integrating AI has Significantly Reduced My Operational Costs**

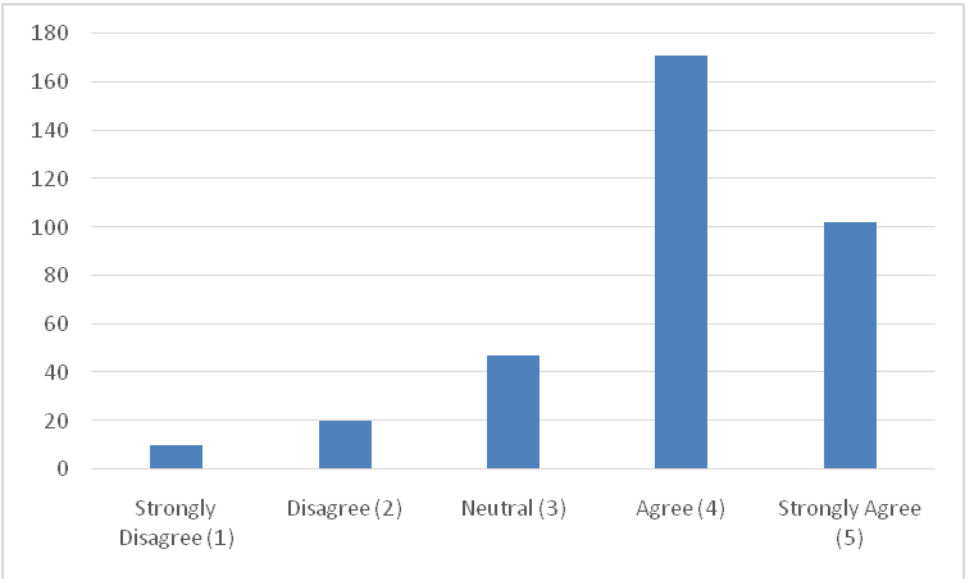


Fig 6.3: Graphical Representation of Integrating AI has significantly reduced my operational costs

Table 3: Frequency Distribution of Integrating AI has significantly reduced my operational costs

Response Scale	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree (1)	10	2.9	2.9	2.9
Disagree (2)	20	5.7	5.7	8.6
Neutral (3)	47	13.4	13.4	22.0
Agree (4)	171	48.9	48.9	70.9
Strongly Agree (5)	102	29.1	29.1	100.0
Total	**350**	**100.0**	**100.0**	

An aggregate 78.0% of the respondents are in agreement or strongly so that the deployment of AI has led to lower operational costs. This indicates that AI can be used to improve economic sustainability, especially in automation, cost optimization, and efficiency improvement.

- **AI-driven data analytics helps predict market trends, ensuring long-term economic stability**

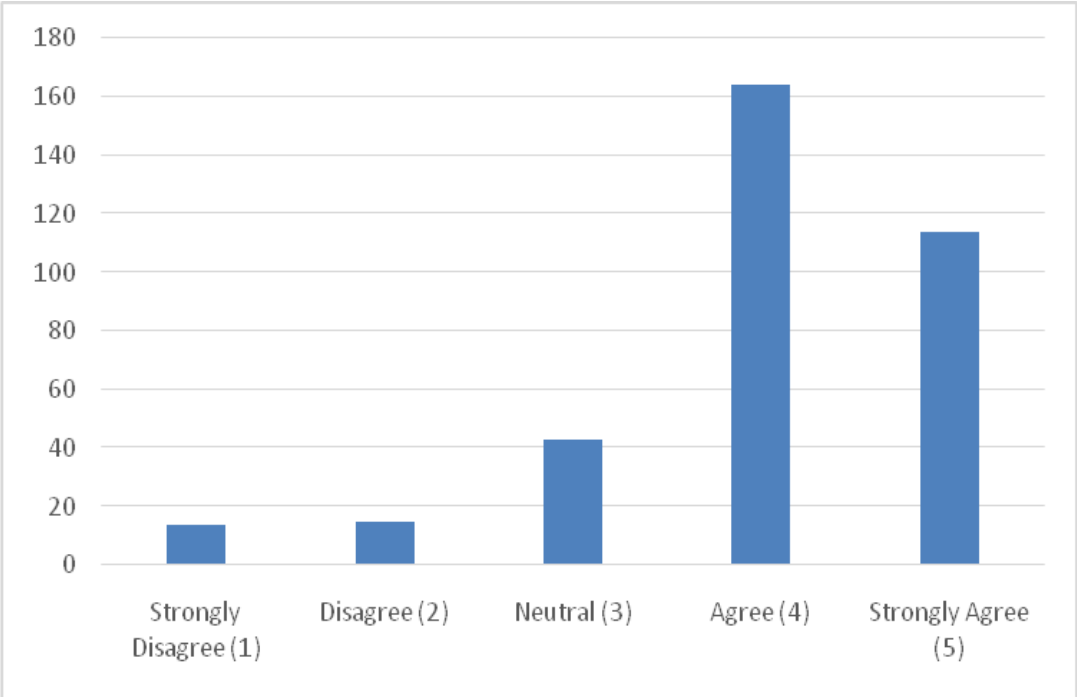


Fig 6.4: Graphical Representation of AI-driven Data Analytics Helps Predict Market Trends, Ensuring Long-term Economic Stability

Table 4: Frequency Distribution of AI-driven Data Analytics Helps Predict Market Trends, Ensuring Long-term Economic Stability

Response Scale	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree (1)	14	4.0	4.0	4.0
Disagree (2)	15	4.3	4.3	8.3
Neutral (3)	43	12.3	12.3	20.6
Agree (4)	164	46.9	46.9	67.4
Strongly Agree (5)	114	32.6	32.6	100.0
Total	**350**	**100.0**	**100.0**	

Almost 79.5% of startups view AI analytics as important in economic sustainability and stability in future. This observation is quite consistent with studying the role of AI in sustainable development of the economy.

- **AI Helps My Business Optimize Resource Usage**

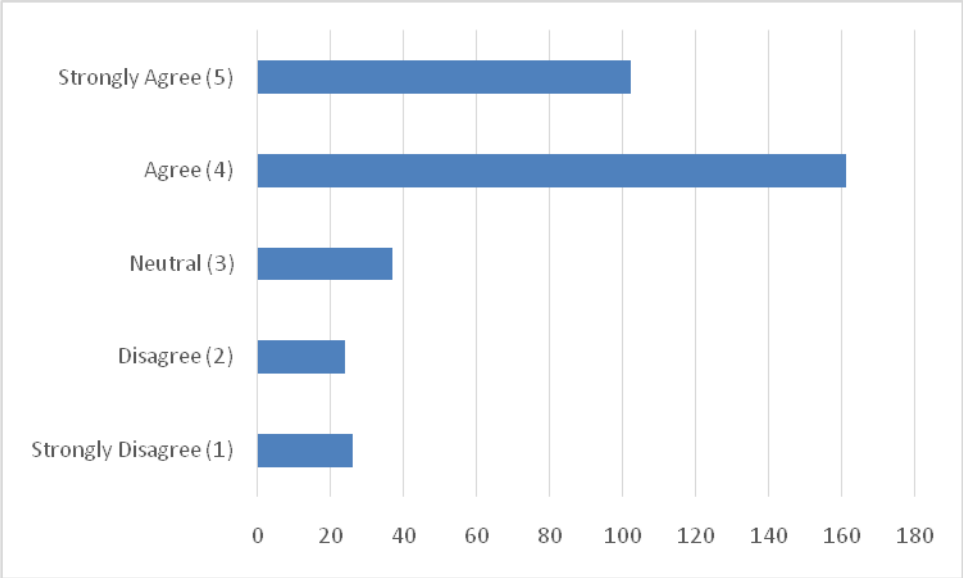


Fig 6.5: Graphical Representation of AI helps my business optimize resource usage

Table 5: Frequency Distribution of AI Helps my Business Optimize Resource usage (Raw Materials, Energy, Time)

Response Scale	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree (1)	26	7.4	7.4	7.4
Disagree (2)	24	6.9	6.9	14.3
Neutral (3)	37	10.6	10.6	24.9
Agree (4)	161	46.0	46.0	70.9
Strongly Agree (5)	102	29.1	29.1	100.0
Total	**350**	**100.0**	**100.0**	

There is a strong consensus (75.1 percent) that AI is a support of environmental sustainability, especially when it comes to efficient resource use, a crucial platform of sustainable development.

Reliability Analysis

The internal consistency of the sustainability-related constructs was assessed using Cronbach's Alpha.

Construct	Cronbach's Alpha	No. of Items
Interrelationship	0.724	7
Sustainable Growth	0.747	7
Challenges	0.748	7
Future Outlook	0.748	7

All constructs exceed the acceptable reliability threshold of 0.70, confirming the consistency and suitability of the questionnaire for further inferential analysis.

Correlation Analysis

Table 6: Pearson Correlation Matrix

Variables	Interrelationship	Sustainable Growth	Challenges	Future Outlook
Interrelationship	1	0.770**	0.775**	0.737**
Sustainable Growth	0.770**	1	0.775**	0.741**
Challenges	0.775**	0.775**	1	0.675**
Future Outlook	0.737**	0.741**	0.675**	1

Note:$p < 0.01$

Strong and statistically significant positive correlations exist between AI interrelationship and sustainable growth (r = 0.770), confirming that higher AI integration is closely associated with stronger sustainability outcomes. This directly supports Objective 1.

One-Way ANOVA Analysis (Regional Differences)

Table 7: ANOVA – Interrelationship by Location

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.427	4	0.357	0.908	0.459
Within Groups	135.507	345	0.393		
Total	136.934	349			

Since p = 0.459 > 0.05, there is no statistically significant difference in AI–sustainability interrelationship across different regions of Assam. The results show that the views on AI-based sustainability are consistent throughout the state.

Discussion

The paper provides viable empirical findings that evidence how AI can catalyse sustainable development in the Assamese startup ecosystem. The outcomes display that the connection between the integration of AI and sustainable growth is statistically significant and positive, which means that the operational and economic advantages can be evaluated in the startups that already implement AI tools (even at primitive stages).The robust correlation identified in investigation suggests that startups implementing AI technologies are more capable of enhancing operational efficiency and predicting market demand. These findings contribute to sustainable development by encouraging startups to optimize economic performance and resource utilization. These discoveries bring into line with prior study (Leelavathi, 2023) that emphasises significance of AI in improving startup efficiency.

In this way, existing research confirms dependence on argument that AI technologies make emergent entrepreneurial ecosystems sustainable. In context of Assam startups in which trades themselves are generally made when there are financial and infrastructural constraints, integration of AI can play vital role in helping sustainable development. This conclusion is particularly significant in state like Assam where startups recurrently work with restricted technological as well as monetary funds. The results indicate that sustainability in entrepreneurial environment can remain intact even partially when AI technologies are implemented.

The agreement about capability of AI to optimise resources, reduce expenditure, predict decision-making indicates need to utilise such technology to enhance organisational resiliency and efficiency, particularly in an organisation with limited resources, and in a regional framework. Results of current research may be related with other prior works in field of AI adoption and sustainable practices. Previous research (Patowary 2020) has shown that AI facilitates green entrepreneurship and environmental sustainability. The current findings, in their turn, relate to context of startups within Assam. Multiple studies have highlighted that AI technologies enhance organisational productivity, and help organisations to utilise their resources efficiently, so they can sustain in long run. Thus, positive correlation is observed in present study of AI use and sustainable development within group of entrepreneurs in Assam, which supports idea that new technologies are able to provide positive change in conditions of dynamic entrepreneurship. Future reports confirm results finding AI as source of innovation, productivity, sustainable competitive advantage in emerging markets.

The overall conclusion of the research, in its turn, is that the perception of sustainability as it influences AI is quite similar in Assamese regions. It is confirmed that there is not much geographic difference in perceived AI value, though there may still be monumental differences between regions due to infrastructural and connectivity problems. The reality that there was no statistically significant regional difference in AI-based sustainability perception means that the possible advantages of AI are widely appreciated across regions of Assam. This shows that even startups operating in rural areas are aware of the value of AI techniques. Nevertheless, the rough accessibility of digital infrastructure, technological skills and financial investment may still limit the depth of AI application in certain districts. The ANOVA results show that these differences in the areas are not statistically weighty, and this means that even a simple introduction of AI can have a benefit of sustainability even in a wide variety of local cases. The general overdependence on primitive AI types and the noticeable absence of advanced applications reveal structural limitations, characterized by limitations in infrastructure, investment, and knowledge.

From a theoretical perspective, these outcomes could also be interpreted through framework of dynamic capability theory. AI enhances startups' ability to identify market opportunities and utilize technology advantages, ultimately encouraging sustained entrepreneurial performance. The conclusions also promote Dynamic Capability Theory, meaning that AI promotes sustainable development of startups.

Even while AI has numerous advantages, the fact that it is directly associated with problems that exist implies that new firms will definitely face both opportunities and challenges when they use it. AI is used in 2 ways in Assamese startup ecosystem because it presupposes certain government and institutional interventions and helps in sustainable development. Such results indicate that sufficient access to digital infrastructure and financial support systems is highly valued in making sure that startups are able to use the benefits of AI to the maximum.

The results of the analysis have great implications on area entrepreneurs, startup support organizations and entrepreneurs. The government is also interested in enhancing digital infrastructure, offering AI training classes, and ensuring that technical resources are more accessible so that new businesses can apply AI. Entrepreneurs can be supported by innovation hubs and startup incubators in making AI-based solutions an aspect of their business model, which will positively impact the sustainability of the local startup ecosystem. Startup entrepreneurs are also expanding beyond traditional AI applications because of financial incentives and mentorship programs that enable AI. Startup incubators, research centers, and universities must collaborate closely and exchange their technological experiments. This type of networking will assist sustainable development in Assam to evolve in a manner that will last long. The current study shows that AI in startups might be potentially feasible entrepreneurship pathway in local contexts like Assam.

Conclusion

The current research indicates significant positive impact on economic advancement plus sustainability of startups in Assam's emerging entrepreneurial ecosystem that adopts AI. The research findings demonstrate strong correlation between AI integration and the principal factors of sustainable growth, including cost reduction, operational efficiency, market prediction, efficient resource utilization. The magnitude of mentioned benefits emphasizes accessibility and usability of AI in emerging and small-scale enterprises, despite present trend that most local startups employ AI at primitive level. This analysis reveals that perceived advantages of sustainability associated with AI are consistent across various geographic regions, suggesting that AI has capacity to promote inclusive development non-megacities level in Assam. Nonetheless, superficial aspect of current AI integration indicates necessity for specific interventions. The persisting economic constraints, lack of qualified staff, other institutional shortcomings will continue to prevent optimal utilization of AI. By addressing these obstacles through customized AI training programs, expanding digital infrastructure, adopting favourable laws, entrepreneurial potential will be significantly enhanced.

The study's findings illustrate importance of Dynamic Capability Theory in emerging startup scenarios. The results indicate that AI enables startups to identify opportunities and threats, as well as respond to dynamic market environment. Consequently, the study enhances literature correlating technological innovation with sustainable entrepreneurial advancement in local startup ecosystems. Policymakers can pursue the extensive implementation of AI to attain SDGs, since AI can enhance incubation ecosystems, promote partnerships between universities and startups, and offer incentives for AI-driven solutions in allied sectors such as agritech and healthcare. Consequently, AI serves not just as supporting element in technological framework of Assamese startups, but as a crucial advancement towards stable, inclusive, and sustainable regional economic path.

Limitations and Future Scope of Study

This study is limited in certain aspects. This research, relying on quantitative data obtained with help of structured questionnaire, might not reflect profound insights of startup entrepreneurs into AI adoption. The research is also restricted to startups in Assam, which may not apply to other regions. Moreover, most respondents have used basic AI applications only, therefore limiting analysis of advanced AI-driven sustainability findings. These limitations can be overcome through further studies by incorporating mixed-method research and broadening investigation to other states or regions. Further research would explore use of AI in most industries and its role as means of promoting sustainable development.

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