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AI for Startups in India: Pathways to Innovation and Competitiveness

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Abstract

77% Adoption Rate: Over 77% of Indian start-ups are investing in advanced technologies, including Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT), and block chain. Operational Efficiency and Growth: These technologies are being utilized to achieve operational efficiency, drive growth, and enhance customer experiences. Digital Disruption: The proactive integration of these technologies signifies the era of digital disruption that Indian start -ups are navigating

Artificial intelligence (AI) has emerged as a transformative force worldwide, and India is no exception. Projections suggest that the global AI market could reach between USD 320 billion and USD 380 billion by 2027, growing at an impressive compound annual growth rate (CAGR) of 25% to 35%. This puts a spotlight on India's rapidly expanding AI sector. According to a report titled "AI Powered Tech Services: A Roadmap for Future Ready Firms; AI & Gen AI's Role in Turbo charging the industry," launched at the Nasscom Technology & Leadership Forum 2024, the growth and potential of AI in India are significant and promising

Keywords: Startups; Innovation Ecosystem; Competitiveness; Digital Transformation India; Entrepreneurial Growth; Technology Adoption; AI Applications; Startup Ecosystem

1. Introduction

Artificial Intelligence (AI) has become a transformative force in the global startup ecosystem, offering unprecedented opportunities for innovation, scalability, and competitiveness. In India, where entrepreneurship is emerging as a vital driver of economic growth, AI provides startups with tools to analyze data, automate processes, and create intelligent solutions across sectors such as healthcare, agriculture, fintech, and logistics. For resource-constrained startups, AI enables the ability to bypass traditional growth barriers, helping them compete with established enterprises. Government initiatives such as *Startup India*, *Digital India*, and the *National AI Strategy* further strengthen this environment, providing policy support, digital infrastructure, and funding incentives. Despite its promise, challenges such as limited access to datasets, skill shortages, high costs, and regulatory ambiguities remain significant hurdles. This paper explores how AI adoption is shaping the Indian startup ecosystem, identifies barriers to implementation, and outlines strategies to enhance innovation and competitiveness.

1.1. Executive Summery

India's AI market is projected to touch$17 billionby 2027[1], Growing at an annualized rate of 25% - 35% between 2024 and 2027

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This presents India with an opportunity which requires consistent and concerted efforts from different stakeholders to recognize AI's transformative potential and actively supports its development through strategic initiatives.

New industries (Start-ups'), which play a critical role as the engine of the Indian economy, stand at a crucial juncture in this era of rapid technological change. Integrating AI will help them to stay relevant and offer them a unique opportunity to unlock unprecedented growth, enhance productivity, and fuel sustainable innovation.

However, for Start-ups' to fully tap into the growth opportunities provided by AI, and for India to reap the AI dividend, it is crucial to understand where STARTUPs currently stand in their AI adoption journey - what are the key challenges and opportunities faced by them.

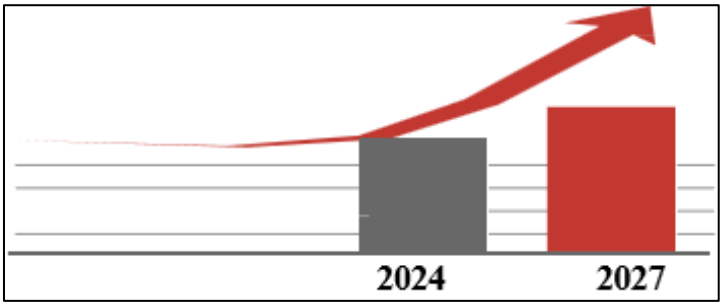

Figure 1 AI Startup flow diagram.

To delve deeper, Nasscom and Meta have come together with a commitment to thoroughly explore the contours of these issues. They partnered with Nvidia to launch the 'AI Enablement for Start-up's program for tech-enabled STARTUPs with following objectives:

1.2. AI Enablement for Start-ups'

Promote AI awareness and Capacity building for Startups	Understand challenges and potential solutions
Catalyze adoption of AI Technologies to improve a business growth	Provide a competitive edge in AI-centric global environment Productivity

Figure 2 AI Enablement for Start-ups'

The program targeted two types of tech-enabled Start-ups'

- Already equipped with resources and manpower
- Just starting their AI journey

The awareness and capacity-building workshops were organized across Gurugram, Hyderabad, Bengaluru, Mumbai, and Pune.

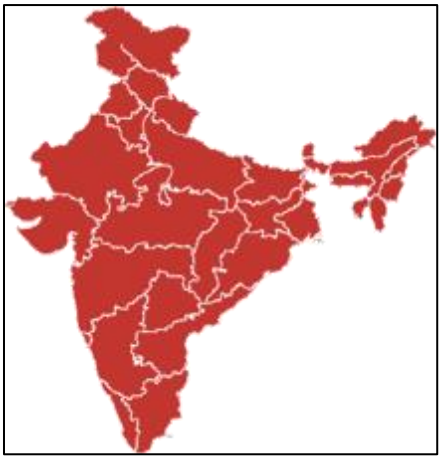

Figure 3 94% STARTUPs acknowledging its ability to Growth

Where they learned about deployment of responsible AI practices, technical aspects around computing, foundational models and other AI products to drive business growth through digital marketing, and enhanced customer support.

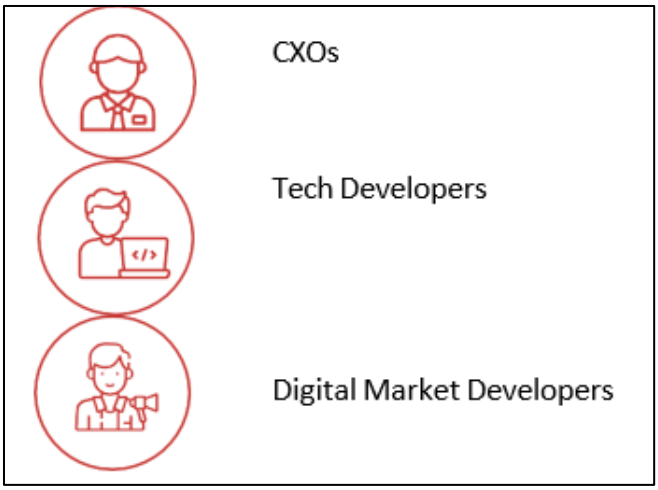

Figure 4 87% confident that it can improve overall productivity

These convening's also gave STARTUPs an opportunity to network with other industry leaders like Intel, E2E networks etc.

1.3. Nasscom also conducted a comprehensive sentiment analysis of the tech-enabled Startups

Assess awareness levels Capture approach towards AI tech

Figure 5 Comprehensive sentiment analysis

The findings from this analysis offer a promising glimpse into the current state of AI adoption among tech-enabled STARTUPs in India. For example, the analysis highlights that there's a Strong belief in potential of AI.

However, a significant gap exists between this belief and actual adoption.

1.3.1. Hurdles in Adoption

Table 1 Hurdles in Adoption

65%	**91%**	**59%**
STARTUPs are unaware about the Right tools and resources to leverage	don't feel technology in widely Accessible and affordable for all	Citebudget constraints

1.4. Need of the Hour - Practical Demonstration of AI improving businesses

- 72% Emphasize on AI training & up skilling programs for the workforce to improve adoption
- 45% Stressed on access to industry – specific use cases

This highlights the need for practical demonstrations showcasing how AI can specifically benefit their businesses.

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2. Research Objective and Methodology

"Empowering India's Growth: Unlocking AI's Potential for Tech-Enabled Start-ups" is a first – of – its - kind publication aimed at enabling adoption of AI among Start- ups' .NASSCOM and Meta have forged a strategic partnership to gain a deeper understanding of the challenges faced by STARTUPs in leveraging AI for improving productivity and business growth. NASSCOM and Meta together launched the 'AI Enablement for Start- ups' program, with focus on tech-enabled STARTUPs with the following objectives

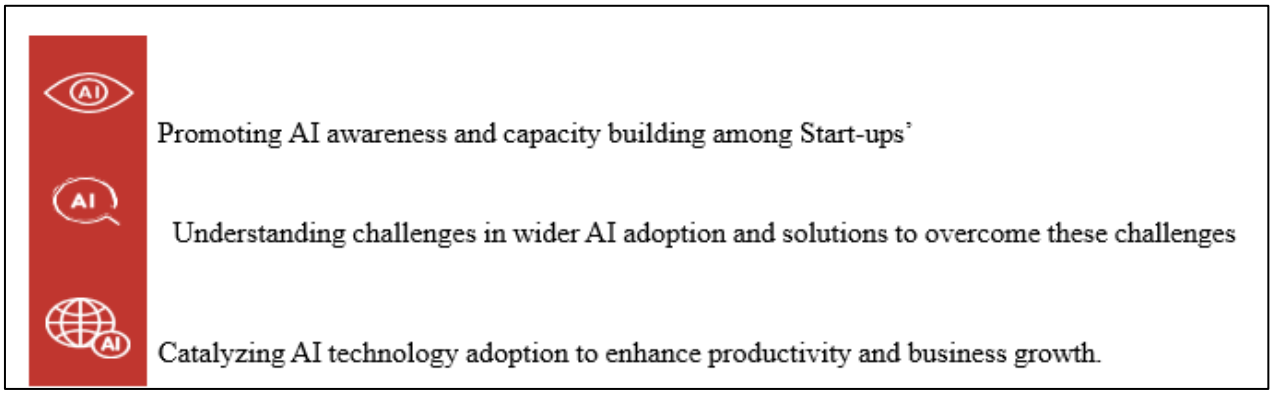

Figure 6 Empowering India's Growth: Unlocking AI's Potential

3. Methodology

The insights for this paper have been gathered from workshops conducted across 5 cities in India with representatives from STARTUPs, and a comprehensive sentiment analysis involving approximately 220+ tech enabled SMEs. We have also captured impact stories of STARTUPs which are at different stages in their AI journey to provide a glimpse into the power of AI in propelling STARTUPs forward in an increasingly digital economic landscape.

3.1. Participant Profile

Start-ups' that have participated in the survey represent a diverse pool of companies having different business models, number of employees in the firm, nature of their key product offering, etc. as highlighted below:

3.2. Business Model

The business model followed by the 220 STARTUPs highlights the cohort's diversity, with 47% engaging in B2B interactions, 11% in B2C, 1% combined in B2G and B2B2G, and 7% involved in B2B2C interactions. Additionally, 34% of STARTUPs demonstrated a diverse portfolio, combining various business models.

3.3. Company Size

In line with the Government of India's definitions, micro- enterprises are characterized by investments in Plant and Machinery or Equipment not exceeding Rs. 1 crore and an annual turnover of not more than Rs. 5 crore. On the other hand, small enterprises have investments in Plant and Machinery or Equipment up to Rs. 10 crore and an annual turnover of not more than Rs. 50 crore. New enterprises fall within the investment range of up to Rs. 50 crore in Plant and Machinery or Equipment, with an annual turnover not exceeding Rs. 250 crores.

Within our STARTUP cohort, 38% represent micro- enterprises, small enterprises constitute 29%, and new enterprises make up 27% of the cohort. Additionally, 4% of the enterprises in our cohort exceed the turnover threshold of Rs. 250 crore, reflecting larger-scale operations. A further 2% comprise other enterprises, such as not-for- profit organizations, highlighting the diverse nature of the STARTUP landscape encompassed in our study. This distribution highlights the varied scales and structures within the STARTUP sector, each contributing uniquely to the economic ecosystem.

3.4. Key Business Activities

Amongst the Start-ups' , application development, product development, and system integration are the major revenue-contributing activities. Additionally, Business Process Management (BPM), and engineering services, among others, also play significant roles in revenue generation, showcasing a diverse range of core business activities driving financial success of these businesses.

3.5. Analysis - Broad Themes

Our analysis focuses on three key themes that are central to understanding AI adoption among tech-enabled STARTUPs in India. We have tried to assess the level of awareness among STARTUPs regarding AI tools, infrastructure requirements, use cases, and deployment strategies; perceived value of AI for improving business productivity and impact of AI on business growth. These themes collectively shed light on the challenges and opportunities faced by STARTUPs as they navigate AI adoption and integration into their business operations.

3.6. Voice of Start-ups'

On AI as an opportunity for business productivity and growth. Start-ups' are the backbone of the Indian economy, contributing significantly to employment and GDP of the count.

3.7. Opportunity for Indian Start-ups'

AI presents a transformative opportunity for Indian STARTUPs, offering solutions to their resource constraints and enhancing their competitiveness. By leveraging AI tools and technologies, STARTUPs can automate processes, improve decision-making, and tap into new growth avenues. However, as reflected in the findings of the sentiment analysis as well as focused interactions during workshops, Indian STARTUPs often grapple with a myriad of challenges that hinder adoption of AI for improving Business productivity and growth. Limited resources, restricted marketing reach, and a scarcity of technical expertise are among the primary pain points faced by These enterprises.

3.8. Key Findings from Sentiment Analysis

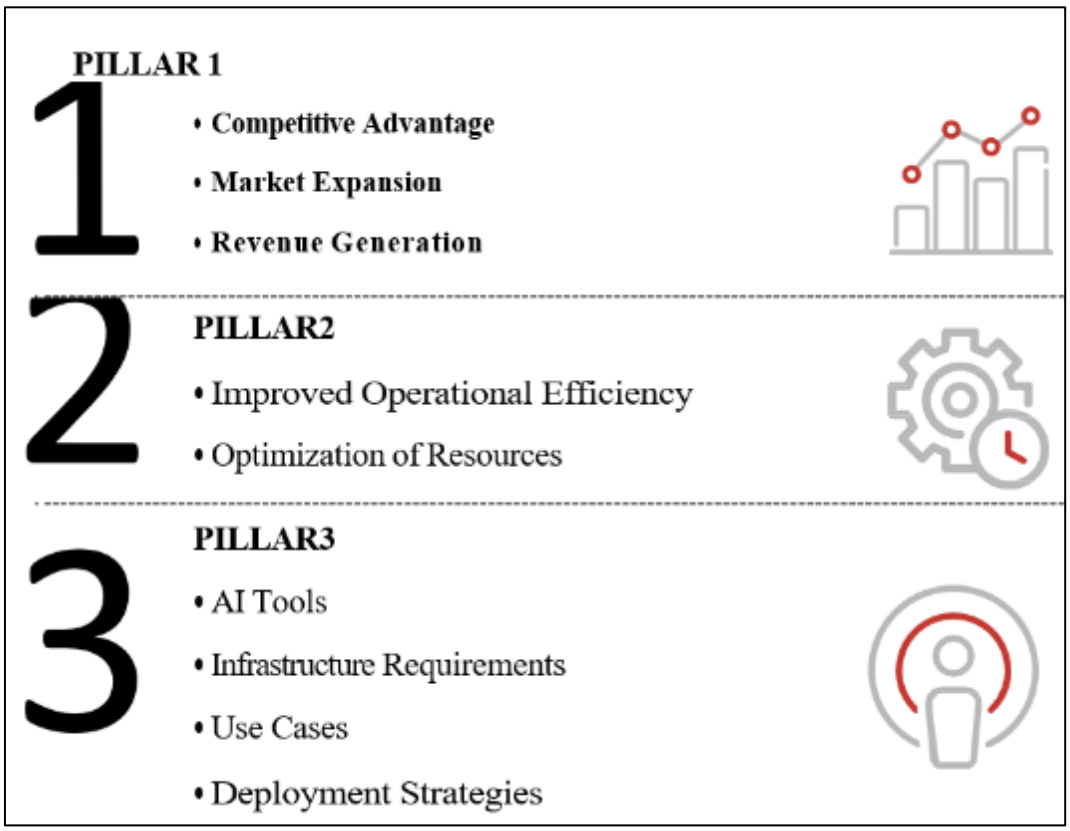

Figure 7 Key Findings from Sentiment Analysis

4. Pillar 1

4.1. Perceived value of ai for improving business growth

94% of tech-enabled Start-ups' believe in AI's potential to build & grow their business

Business growth is a fundamental goal for all enterprises, including tech-enabled Start-ups'. It encompasses the expansion of market share, increased revenue, and overall advancement in the organization's capabilities and offerings. Start-ups Can leverage AI tools and technologies to achieve these objectives more efficiently, effectively, and sustainably

4.2. Key Contribution Areas

Table 2 Contribution Areas

48%	**46%**	**68%**
Content creation & marketing	Customer engagement	Developing new products & services

This high level of confidence highlights the widespread recognition amongst Start-ups' regarding the transformative power of AI in driving business growth. Despite the optimism surrounding AI's potential for business growth, tech-enabled Start-ups' face several challenges in realizing these benefits. These challenges span from resource constraints and limited access to specialized AI talent to concerns about data privacy and security. Understanding and navigating these hurdles are crucial for Start-ups' to effectively leverage AI for sustainable business expansion and competitiveness in the market.

4.3. Challenge 1

4.3.1. Lack of Contextual Use Cases

45% of tech enabled STARTUPS emphasized the importance of gaining access to industry and sector-specific use cases to understand the practical applications and benefits of AI. Without such use cases, Start-ups' struggle to grasp the tangible advantages that AI can offer to their businesses. Understanding how AI has been successfully applied in their specific industry context is crucial for Start-ups' to envision and implement effective strategies, making this issue a key concern for their AI adoption journey.

4.4. Challenge 2

4.4.1. Lack of Toolkits and Focused Training

While tools may be available, the lack of toolkits and training materials for marketers hinders their ability to effectively utilize these tools for business growth. This challenge restricts the full potential of AI adoption, as Start-ups' may not have the necessary resources or knowledge to leverage these technologies optimally

4.5. Challenge 3

4.5.1. Low Adoption of AI Solutions

There is low interest in adopting solutions developed by tech- enabled Start-ups' among new and large enterprises, leading to limited wider adoption of AI technologies. Overcoming this challenge requires building trust and showcasing the value proposition of AI solutions developed by Start-ups' to larger enterprises.

4.6. Challenge 4

4.6.1. Inability to Scale Up

AI solutions often require scalability to accommodate growing business needs and increasing data volumes. Start- ups' struggle to scale their AI infrastructure and applications, particularly if they lack the resources and technical capabilities to do so. This scalability challenge can hinder the long-term success and impact of AI adoption in Start-ups.

4.7. Challenge 5

4.7.1. Data Governance

- Lack of understanding of existing Data Protection Laws of India: There is a lack of understanding of data protection laws of India, making it difficult for Start-ups' to manage data effectively and comply with regulations.
- Data Privacy and Security: 56.4% of Start-ups' have raised concerns regarding the protection of sensitive data and the implementation of robust security measures, underscoring the importance of data privacy and security in their operations.

4.8. Challenge 6

4.8.1. Resource Constraints

Resource constraints pose a significant challenge for tech- enabled Start-ups in adopting AI technologies. Financial limitations affect 59% of these enterprises, hampering their ability to invest in necessary tools and resources. Another key impediment in adopting AI technologies is the high cost of compute infrastructure, as highlighted by tech enabled Start-ups. 91% of tech enabled Start-ups' believe that AI technologies should be democratically available. Additionally, limited access to training resources, as highlighted by 72% of Start-ups, present a critical issue in developing the necessary expertise within their workforce to effectively implement and manage AI solutions.

5. Pillar 2

5.1. Perceived value of ai for improving productivity

87% of tech-enabled Start-ups' believe in AI's potential to improve productivity Attaining productivity is a cornerstone of business success, encompassing the efficient utilization of resources to achieve optimal outputs. For tech-enabled

Start-ups', productivity translates to streamlining processes, reducing operational inefficiencies, enhancing output quality, and ultimately maximizing profitability. Leveraging AI tools and technologies to automate tasks, streamline workflows, and empower teams to work smarter and more effectively, aligns perfectly with the goal of enhancing business productivity for tech-enabled Start-ups'. Despite the high expectations of improving productivity through AI adoption, tech-enabled Start-ups' face significant challenges in areas such as technical integration, and data quality

5.2. Challenge 1

5.2.1. Data Quality Issue

Low-quality data undermines the accuracy and reliability of AI models, leading to flawed insights and decision-making. Inconsistencies, incompleteness, or biases in the data impede the effectiveness of AI algorithms, necessitating rigorous training in data cleaning and maintenance to optimize the potential and precision of AI solutions.

5.3. Challenge 2

5.3.1. Integration with Existing Systems

Integrating AI solutions into established business frameworks poses challenges, particularly for Startups operating with legacy IT infrastructure. The integration process often encounters compatibility issues and technical complexities, requiring significant time and resource investments to effectively address and resolve these obstacles.

5.4. Challenge 3

5.4.1. Lack of Expertise

Despite 74% of repetitive task performers recognizing AI's potential for automation, a challenge remains in identifying suitable processes and tools for seamless integration into existing workflows. A common hurdle for many Start-ups' lies in their limited in-house technical expertise to effectively develop and implement AI solutions. This often translates into difficulties in understanding complex algorithms, data science methodologies, and the intricacies of integrating AI into established systems.

6. Pillar 3

6.1. Lack of awareness around AI

65% of tech-enabled Start-ups' are unable to leverage AI due to lack of tools & resources

The exploration of AI awareness as a part of sentiment analysis of Start-ups' delved into understanding how well-informed tech- enabled Start-ups' are about AI tools and technologies, practical use cases across their industry, and the strategic methods for integrating AI into business operations. This analysis aimed to uncover awareness gaps that could impede optimal AI adoption and utilization among these enterprises. It was identified that limited awareness poses a critical challenge for Start-ups' to unlock their full potential in AI adoption. They struggle due to a lack of peer guidance, inadequate understanding of AI tools and technologies, and insufficient knowledge about the practical applications and benefits of AI in their specific business contexts.

6.2. Challenge 1

6.2.1. Blindspot on AI Tools

65% of tech-enabled Start-ups' report a lack of awareness about the deployment of AI tools and resources as the top challenge in adopting AI technologies. This lack of awareness hinders their ability to identify suitable AI solutions and effectively integrate them into their business processes. 57% of tech-enabled Start- ups' struggle with a shortage of technical expertise necessary for implementing AI solutions. This skill deficit hampers their ability to fully utilize these advanced technologies, as they often lack the in-house capabilities to develop, integrate, and manage AI systems.

6.3. Challenge 2

6.3.1. Lack of guidance and awareness in complying with the existing legal frameworks

More than half (52%) of tech-enabled Start-ups highlight the need for guidance and support to ensure they can build compliant businesses from the start.

6.4. Challenge 3

6.4.1. Insufficient Peer Support

Tech-enabled Start-ups' in India face a hurdle in knowledge sharing and collaborative learning due to the limited availability of strong industry networks and peer mentorship programs. This insufficiency in peer support significantly impacts AI adoption, with 78% of businesses indicating they would be more likely to implement AI within the next three quarters if adequate peer support was available.

Recommendations

To address the challenges discussed, it is imperative for key players to come together and support the Start-up ecosystem. Collaborative efforts are essential to create a conducive environment for AI enablement, ensuring that Start-ups' can effectively leverage AI tools and

- Awareness and Training Initiatives Campaigns
    - Launch targeted campaigns and initiatives to educate and build awareness among clients about the benefits, reliability, and transparency of AI technologies, aiming to boost trust and confidence in their adoption.
- Skill Development Programs
    - Offer training programs, workshops and online courses tailored to the needs of Start-ups' to enhance their technical expertise in AI.
- Peer Learning Networks
    - Establish forums or networking platforms where Start-ups' can share experiences, best practices, and challenges related to AI adoption.
- Partnership Certification programs
    - In partnership with IITs and other institutions of prominence we can establish a program with authority and authenticity.
- Awareness on data protection laws of India and compliance
    - Need for training and raising awareness for Start-ups' on data protection laws implementation, and robust compliance mechanisms to help Start-ups' build compliant businesses from the outset.

7. Hyper-local Accelerator Programs for Tech- enabled Start-ups'

7.1. Financial Support

Given the significant budget and resource constraints faced by 59% of tech-enabled Start-ups', coupled with the 57% that struggle with a lack of technical expertise, it is crucial to deploy government sponsored accelerator programs and promote cost effectiveness through adoption of open foundational models and distributed compute infrastructure.

7.1.1. Grants and Subsidies for Technical Training

Provide grants or subsidies for Start-ups' to access technical training programs and workshops. These practices allow for experimentation and innovation without the pressure of immediate high stakes. The necessity of these approaches is underscored by the sentiment analysis among tech-enabled Start- ups in continuation of Nasscom's AI Adoption Index, which revealed that 100% of tech-enabled Start-ups' believe sandboxing and iterative development are essential for fostering confidence in AI adoption.

7.1.2. Government Aid

Start-ups' require government help right from offering grants, subsidies, or tax incentives to funding opportunities for scaling AI. Offer flexible pricing models and financing options to make AI solutions affordable for Start-ups'. Provide access to government funding programs or venture capital for AI projects.

7.2. Partnerships and Collaborations

Facilitate partnerships between Start-ups' and AI solution providers, technology consultants, or research institutions. Government grants or incentives can incentivize such partnerships and foster innovation within the STARTUP sector. There needs to be a platform supported by industry, trade and government where use cases from across sectors could be showcased. Industry bodies should run campaigns focused on tech Start-ups' to disseminate use cases in regional

languages. Launch targeted campaigns and initiatives to educate and build awareness among clients about the benefits, reliability, and transparency of AI technologies, aiming to boost trust and confidence in their adoption.

7.2.1. Data Collaboration

Provide training for synthetic data generation techniques to supplement real data for training AI models. Focus on AI solutions that require less data for training, like open-sourcing learning models with requisite limitations. Data cleaning and management tools.

7.2.2. Focused Intervention related to Data

Conduct comprehensive programs focused on data governance, ethical data sourcing, and responsible use of AI. These programs should equip Start-ups' with the knowledge and skills to handle data responsibly and leverage AI technologies effectively to improve overall productivity.

Creating a data governance playbook for Start-ups' which includes industry-wide best-practices regarding data sourcing, processing and analysis. Create public-private partnerships to establish AI research and development funds for small businesses.

7.2.3. Building Start-ups' Accessible Tools and Resources

Develop or promote user-friendly AI tools specifically designed for Start-ups', with intuitive interfaces and documentation. These tools should prioritize ease of implementation and integration with existing business processes, reducing the technical barriers for adoption. Develop scalable AI solutions that can accommodate the growth and evolving needs of Start-ups'. Provide support for scaling AI infrastructure and applications as business requirements change. Create incentives for technology vendors to develop standardized APIs and integration tools that facilitate the seamless integration of AI systems with existing IT ecosystems. Recognize user enterprises which are championing the adoption of AI solutions to appreciate their role in the India AI story. Building use cases for high impact areas vis-a-vis business growth such as content development, marketing, customer engagement, and new product development should be encouraged.

8. Conclusion

Artificial Intelligence is reshaping the trajectory of startups in India by enabling innovation, operational efficiency, and global competitiveness. For emerging ventures, AI serves as both a growth accelerator and a strategic differentiator, helping them overcome resource constraints while building scalable and intelligent solutions. Despite its transformative potential, the adoption of AI faces hurdles including limited access to quality data, skill gaps, high infrastructure costs, and evolving regulatory frameworks. However, government initiatives such as Startup India and Digital India, combined with rising venture capital investments and innovation hubs, are fostering an ecosystem that supports AI-driven entrepreneurship. For India to fully harness this potential, inclusive access, skill development, ethical governance, and collaborative industry–academia partnerships will be critical. By addressing these challenges, Indian startups can leverage AI not only to strengthen domestic innovation but also to establish India as a global leader in the AI-driven digital economy.

Compliance with ethical standards

Disclosure of Conflict of Interest

The authors declare that they have no known financial or non-financial conflicts of interest that could have influenced the work reported in this paper.

Data Availability

No primary datasets involving personal or sensitive information were generated or used in this study. All supporting literature and references are publicly available sources.

Ethical Responsibility

The authors confirm that the manuscript is original, has not been published elsewhere, and is not under consideration by any other journal. Proper citations and acknowledgments have been provided to avoid plagiarism and ensure academic integrity.

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