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AI ADOPTION IN MSME SECTORS – A COMPREHENSIVE ANALYSIS

*[1]Dr. P. Baby, [2]Dr. R. Ramachnadran

[1]Assistant Professor in Commerce, Sona college of Arts and Science, Salem – 636005.

[2]Assistant Professor in Economics, Sona college of Arts and Science, Salem – 636005.

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***Corresponding Author: Dr. P. Baby**

Assistant Professor in Commerce, Sona college of Arts and Science, Salem – 636005.

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ABSTRACT

Artificial Intelligence (AI) has become one of the most talked-about technologies today, playing a crucial role in improving business productivity and driving innovation. For Micro, Small, and Medium Enterprises (MSMEs), however, the adoption of AI is still at a relatively early stage compared to larger organizations and even other digital tools. In India, the use of AI among MSMEs is gradually increasing and shows strong potential to generate significant economic value—running into billions. Around 45% of MSMEs have started using AI in some capacity, but its full-scale implementation is still limited. This is mainly due to challenges such as high investment costs, shortage of skilled professionals, and lack of awareness about AI capabilities.

KEYWORDS: *Artificial Intelligence, MSMEs, Technological Innovation, Digital Transformation.*

INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has revolutionized global business environments. AI technologies such as machine learning, natural language processing, and predictive analytics are reshaping how organizations operate and compete. MSMEs play a critical role in economic development by contributing to employment generation, GDP growth, and industrial output. In India, MSMEs account for a significant share of industrial production and exports. However, their adoption of AI technologies is relatively lower compared to large enterprises. Despite this, there is growing recognition that AI can serve as

a catalyst for innovation, enabling MSMEs to improve productivity, optimize processes, and enhance customer experiences.

MINISTRY OF MSME

The Ministry of MSME in a major initiative has on boarded latest IT tools of Artificial Intelligence (AI) and Machine Learning (ML) for providing assistance and solutions to the issues of Micro, Small, and Medium Enterprises (MSMEs). Ministry has implemented AI & ML on its robust Single Window System 'Champions' which was launched by the Prime Minister on 1st June, 2020. This multi-modal system has a portal at virtual level and technology equipped physical control rooms at around 69 locations of the country. It has emerged as one of the front runner platforms for the MSMEs in a very short span of time. Ministry of MSME has taken Covid-19 as a challenge and is converting it into an opportunity with futuristic interventions. In this difficult period, Ministry is not only whole-heartedly supporting the MSMEs and trying to convert this crisis into an opportunity, but is in fact making them break their barriers, make a paradigm shift and become champions.

MSME Ministry further said that it is working aggressively to take the Nation and the MSMEs in the direction of Industry 4.0. They are not only adopting the technologies categorized as part of Industry 4.0 but are also encouraging the MSMEs to adopt the same. They are also helping the MSMEs to manufacture its essential and enabling products like sensors, motors, computer displays and other animation technologies. In this very sequence, as promised earlier, Ministry has implemented Artificial Intelligence (AI) and Machine Learning (ML) on their Champions portal. Technology Company Intel is their partner in this journey. Intel has guided the Ministry for last five months in implementing some of the tools of AI & ML which are ready for use from TODAY. Ministry has also said that Intel and its technology partner have implemented the entire domain of AI & ML at their Champions portal totally free of cost. It has elaborated the work done by the Ministry in this direction during the AI Summit organized by Intel.

Objectives of the Study

1. To analyse the level of AI adoption in MSME sectors
2. To examine the role of AI in technological innovation
3. To identify key challenges faced by MSMEs
4. To propose strategies for enhancing AI adoption

Literature Review

M. H. Bala Subrahmanya (2012) , SMEs, due to their unique characteristics, are found to have inherent capabilities to undertake technological innovations successfully across industries and nations. While there is considerable empirical evidence to throw light on SME innovation contributions in the context of developed countries, there is hardly any evidence to reveal how innovative SMEs are in rapidly industrializing economies like India. This paper reveals the core findings of two empirical "Innovation Projects" implemented in the previous decade in Bangalore, the globally known high-tech city of India. Indian SMEs are largely incremental innovators, prompted by their customers and involved in product and/or process innovations. But majority carried out innovations with internal efforts only whereas the minority which obtained external support, had better technical strength, indulged in more frequent and both product & process innovations. Such SMEs achieved better innovation performance as well as better economic performance. Some of them internationalized themselves in the process. However such achievements are "an oasis" in the vast Indian SME sector. How to promote (i) innovations, (ii) quality of innovations and (iii) patenting culture among the SMEs is a challenge for Indian Policy Makers. The paper concludes with proposing some policy recommendations in this direction.

Prateek Chaturvedi (2024)

Micro, small and medium enterprises (MSMEs) are considered the back bone of the national economy due to their versatile contributions in terms of employment generation, export promotion and removal of regional imbalance. There is the evidence that these MSMEs are not operating at its maximum potential output due to their technological obsolescence. This paper explores the innovation in MSMEs by the academic intervention to improve the productive performance of MSME sector in India.

AI for MSMEs

- **Efficiency Gains**: Automating routine processes frees up time for owners and managers to focus on growth and customer engagement.
- **Cost Savings**: AI-powered tools can handle tasks like customer service, data entry, or marketing analytics at a fraction of the cost of manual labour.
- **Competitiveness**: With large companies already leveraging AI, MSMEs risk falling behind if they don't adopt practical solutions.

- **Scalability**: AI allows businesses to grow without proportional increases in costs, making expansion easier.
- **Practical Use Cases of AI for MSMEs**
- **Customer Support Automation**

Use AI-powered chatbots to answer common customer queries 24/7.

Tools like WhatsApp Business API with AI integrations can help small retailers manage customer communication more effectively.

This reduces dependency on large customer service teams while improving response times.

- **Smart Inventory Management**

AI tools can predict demand patterns based on sales history and seasonality.

For example, a textile MSME can use AI-based software to forecast fabric demand during festive seasons, reducing overstocking or stock outs.

Predictive analytics ensures better cash flow and reduces wastage.

- **Automated Marketing**

AI helps MSMEs personalize marketing campaigns at scale.

Small businesses can use platforms like Mail chimp or Zoho Campaigns with AI insights to segment audiences and send targeted messages.

Social media ads can also be optimized using AI tools to reach the right customers without overspending.

- **Accounting and Finance**

AI-powered bookkeeping tools such as Tally Prime with AI plugins or Zoho Books automate invoice management and reconciliation.

Expense categorization and fraud detection become easier, allowing business owners to focus on strategic financial planning.

- **Hiring and Talent Management**

MSMEs often struggle with recruitment. AI tools can filter resumes, schedule interviews, and even assess candidates using predefined criteria.

This reduces hiring time and ensures better quality matches.

- **Quality Control in Manufacturing**

AI-enabled image recognition tools can detect product defects in real-time. Indian MSMEs in sectors like auto components or consumer goods can benefit from this to reduce errors and maintain quality standards.

- **Challenges and Opportunities**

Cost Sensitivity: Many MSMEs believe AI is expensive, but cloud-based subscription models make tools affordable.

Digital Readiness: Government initiatives like *Digital India* and *MSME Digital Saksham* are creating awareness and improving adoption.

Regulatory Push: With GST and compliance systems already digitized, AI can integrate smoothly into existing frameworks.

Skilled Workforce Gap: MSMEs may lack in-house AI expertise, but outsourcing to consultants or adopting ready-to-use platforms can bridge the gap.

- **Steps for MSME Owners**

Start Small: Pick one business process (e.g., customer service or inventory) to automate before expanding.

1. **Leverage Affordable Tools**: Explore subscription-based AI tools rather than custom-built solutions.
2. **Train Staff**: Ensure your team is comfortable with the tools by providing short training sessions.
3. **Measure Impact**: Track ROI from AI adoption by monitoring cost savings, time saved, or improved customer satisfaction.
4. **Seek Expert Guidance**: Engage with MSME consulting services to build a roadmap for AI adoption aligned with your growth strategy.

Scope of AI Application in MSMEs

Level	MSME Context	Example (MSME Scenario)
None	The MSME does not utilize AI in any strategic or operational activities. Business processes remain manual or rely on basic digital tools without intelligent automation.	A small retail MSME maintaining inventory and sales records manually or using basic spreadsheets without any AI-enabled tools.
Isolated	The MSME adopts AI in limited, standalone use cases by specific individuals or teams, mainly for experimentation or pilot projects, without integration into core operations.	A small service-based MSME using a chatbot on its website to respond to customer queries, without linking it to CRM or backend systems.
Functional	The MSME uses AI tools within specific functions such as marketing, finance, or operations. However, these applications operate independently without integration	A digital marketing MSME using AI tools like ChatGPT for content creation and AI-based design tools for campaign visuals, without integrated workflows.

	across departments.	
Cross-functional	The MSME deploys AI across multiple departments with partial integration. There is emerging coordination, shared data usage, and initial governance mechanisms.	A medium-sized e-commerce MSME using AI for inventory forecasting, customer analytics, and marketing automation, with partial integration between systems.
Enterprise-wide	The MSME fully integrates AI across all business functions. AI supports both operational efficiency and strategic decision-making, with organization-wide adoption and unified systems.	A manufacturing MSME leveraging AI for predictive maintenance, supply chain optimization, customer insights, and financial forecasting, enabling data-driven strategic decisions.

Table 1: MSME and AI-related Statistics in India.

Indicator	Value
MSME contribution to GDP	30%
Total MSMEs in India	Approximately 64 million
MSMEs digitalized	53.8%
Manufacturing MSME AI adoption	Approximately 15%
AI adoption in organized manufacturing	Less than 25%
Potential economic value through AI adoption by 2030	USD 500 billion
Employees in India using AI several times weekly	80%

(Sources: Industry reports and surveys)

Data Interpretation

Digital readiness among MSMEs

About 53.8% of Indian MSMEs are digitally enabled, indicating that over half of enterprises possess basic digital infrastructure necessary for AI implementation. However, digitalization alone does not imply AI maturity.

Findings: Digital transformation creates a foundation for future AI expansion.

Low AI penetration

Manufacturing MSMEs show approximately 15% AI adoption, indicating a substantial gap between awareness and practical implementation.

Findings: Most MSMEs remain in experimental or early adoption phases.

Economic impact potential

Studies estimate AI implementation in Indian MSMEs could create over USD 500 billion in economic value by 2030.

Findings: AI offers major long-term opportunities for economic growth and competitiveness.

Workforce AI usage

India leads workplace AI usage, with 80% of employees using AI tools several times weekly.

Findings: Employee readiness appears stronger than organizational readiness, suggesting that MSMEs may benefit from structured AI integration.

Key Drivers for AI Adoption in Indian MSMEs – Detailed Explanation

Artificial Intelligence (AI) adoption among Indian MSMEs is increasing due to various technological, economic, and market-related factors. These drivers motivate small and medium businesses to integrate AI into their operations to improve efficiency and competitiveness. A detailed explanation of the major drivers is given below:

1. Digital Transformation Initiatives

Digital transformation refers to the integration of digital technologies into business activities. In recent years, India has experienced rapid digital growth due to increased internet access, smartphone usage, and online business practices. Government initiatives such as Digital India have encouraged MSMEs to adopt technology-based solutions. As MSMEs become more digitally connected, the transition towards AI-based tools becomes easier. Digital transformation creates the necessary infrastructure and environment for AI implementation.

2. Cost Reduction and Operational Efficiency

One of the major reasons for AI adoption is its ability to reduce operational costs and increase efficiency. AI automates repetitive tasks such as data entry, customer inquiries, invoice generation, and inventory tracking. Automation reduces dependence on manual labor and minimizes human errors. As a result, businesses save time and resources while improving productivity and operational performance.

3. Increasing Market Competition

MSMEs operate in highly competitive markets where businesses continuously seek ways to differentiate themselves. AI helps organizations improve decision-making, optimize business processes, and provide better services to customers. Companies using AI technologies gain a competitive advantage through faster operations and more effective business strategies. Therefore, competitive pressure acts as an important driver for AI adoption.

4. Rising Customer Expectations and Personalization

Modern customers expect businesses to understand their needs and provide personalized products and services. AI systems analyze customer behavior, purchase patterns, preferences, and feedback to deliver customized recommendations. Personalized marketing and improved

customer experiences increase customer satisfaction and loyalty. Consequently, MSMEs are increasingly adopting AI tools to meet changing customer expectations.

5. Availability of Affordable AI Solutions

Earlier, AI technology required significant financial investment and was mainly accessible to large organizations. However, cloud computing and subscription-based software models have reduced the cost of AI implementation. Many AI applications are now available as affordable Software-as-a-Service (SaaS) platforms. MSMEs can access AI tools without investing heavily in infrastructure, making adoption more practical and financially feasible.

6. Government Support and Policy Initiatives

The Government of India has introduced several initiatives to support technology adoption among MSMEs. Programs such as Digital India, Startup India, Skill India, and MSME development schemes provide financial assistance, training opportunities, and digital infrastructure support. Government encouragement through subsidies and awareness programs acts as a significant factor driving AI adoption among MSMEs.

7. Growth in Internet and Smartphone Penetration

India has witnessed substantial growth in internet connectivity and smartphone usage over the past decade. Affordable mobile devices and low-cost internet services have enabled businesses to access digital platforms and AI-powered applications easily**.** Better connectivity allows MSMEs to use AI tools for communication, sales, marketing, and customer management.

8. Improved Availability of Business Data

Data is considered the foundation of AI systems. MSMEs generate large amounts of data through online transactions, customer interactions, digital payments, and e-commerce activities. AI technologies analyze this data to identify trends, customer preferences, and business opportunities. Better access to structured data encourages organizations to adopt AI for informed decision-making.

9. Enhanced Access to Financial Services

Financial institutions increasingly use AI technologies for credit analysis, loan approval, and risk assessment processes. MSMEs maintaining digital records and adopting AI-based systems improve their credibility and access to finance. Efficient financial management and easier loan processing motivate businesses to integrate AI technologies into their operations.

10. Workforce Productivity Improvement

AI technologies help employees perform tasks more efficiently by reducing workload and automating routine activities. AI-based tools such as virtual assistants, analytics software, and intelligent systems enable employees to focus on strategic and creative work. Increased productivity and improved employee performance encourage MSMEs to adopt AI solutions.

11. Expansion of E-commerce and Online Platforms

The growth of e-commerce platforms has created new business opportunities for MSMEs. AI helps businesses manage online operations through customer analytics, demand forecasting, pricing optimization, and personalized marketing. As more **businesses shift toward digital marketplaces, AI adoption becomes necessary for maintaining competitiveness.**

12. Post-Pandemic Digital Adaptation

The COVID-19 pandemic accelerated digital transformation across industries. Many MSMEs adopted online operations, remote work systems, and digital communication tools during the pandemic period. AI technologies supported businesses in managing customer interactions, maintaining supply chains, and improving operational resilience. This shift increased awareness regarding the importance of AI and accelerated its adoption.

CONCLUSION

Artificial Intelligence (AI) has emerged as a powerful catalyst for transforming the MSME sector in India by enhancing productivity, improving operational efficiency, encouraging innovation, and strengthening business competitiveness. The study reveals that although AI adoption among Indian MSMEs is gradually increasing, its implementation remains at an early stage due to challenges such as high investment costs, limited awareness, inadequate digital infrastructure, and shortage of skilled professionals. At the same time, factors such as digital transformation initiatives, affordable AI solutions, government support, growing internet penetration, and increasing customer expectations are creating favorable conditions for wider adoption. Statistical analysis indicates that AI has significant potential to generate economic value and improve business performance across MSMEs. Therefore, coordinated efforts from policymakers, educational institutions, technology providers, and business organizations are necessary to promote AI awareness, skill development, and infrastructure support. In the long run, effective AI adoption can significantly contribute to the sustainable growth, competitiveness, and technological advancement of MSMEs while supporting India's overall economic development.

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