

## Artificial Intelligence Adoption in Developing Economies: Barriers and Opportunities

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### Abstract

Artificial Intelligence (AI) is transforming economies by enhancing productivity, innovation, and decision-making across various sectors. While developed nations have made significant progress in AI adoption, developing economies continue to face unique challenges that limit the widespread implementation of AI technologies. Despite these constraints, AI presents substantial opportunities for accelerating economic growth, improving public service delivery, strengthening industrial competitiveness, and addressing socio-economic challenges. This paper examines the barriers and opportunities associated with the adoption of Artificial Intelligence in developing economies through a comprehensive review of recent literature and emerging practices. It explores key barriers, including inadequate digital infrastructure, limited financial resources, shortage of skilled professionals, insufficient research and development capacity, data availability and quality issues, cybersecurity risks, regulatory uncertainty, and ethical concerns. Simultaneously, the study highlights the transformative potential of AI in sectors such as healthcare, agriculture, education, manufacturing, financial services, governance, and small and medium-sized enterprises (SMEs). The paper further discusses the role of government policies, public-private partnerships, digital literacy, cloud computing, and international collaboration in fostering AI adoption and innovation. Emerging technologies such as generative AI, edge computing, and explainable AI are also examined for their potential to bridge technological gaps and support inclusive development. The study concludes that while significant obstacles remain, strategic investments in infrastructure, human capital, regulatory frameworks, and innovation ecosystems can enable developing economies to harness AI as a catalyst for sustainable economic development and global competitiveness. The findings provide valuable insights for policymakers, researchers, business leaders, and development agencies seeking to promote responsible and inclusive AI adoption.

**Keywords:** Artificial Intelligence, Developing Economies, Digital Transformation, Emerging Markets, Technology Adoption

### Introduction

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of the twenty-first century, reshaping economies, industries, and societies through intelligent automation, predictive analytics, and data-driven decision-making. Advances in machine learning, deep learning, natural language processing, computer vision, and robotics have enabled organizations to improve productivity, optimize resource utilization, and develop innovative products and services. AI is increasingly recognized as a strategic driver of economic growth and digital transformation, influencing sectors such as healthcare,

agriculture, manufacturing, education, finance, transportation, public administration, and environmental management. While developed economies have rapidly adopted AI technologies due to strong digital infrastructure and substantial investments in research and innovation, developing economies are still at varying stages of AI adoption. Developing economies face unique socio-economic and technological conditions that influence the pace and effectiveness of AI implementation. Many of these countries continue to experience challenges related to limited digital infrastructure, inadequate internet connectivity, shortage of skilled professionals, insufficient research and development capacity, financial constraints, fragmented data ecosystems, and regulatory uncertainties. Small and medium-sized enterprises (SMEs), which constitute a significant proportion of businesses in developing countries, often lack the financial resources and technical expertise required to adopt advanced AI solutions. In addition, concerns regarding cybersecurity, data privacy, ethical governance, and algorithmic bias further complicate the large-scale deployment of AI technologies. Despite these barriers, Artificial Intelligence presents unprecedented opportunities for accelerating inclusive and sustainable development. AI-powered solutions have the potential to improve agricultural productivity through precision farming, optimize healthcare delivery by supporting disease diagnosis and telemedicine, enhance educational outcomes through personalized learning systems, strengthen financial inclusion using intelligent fintech solutions, and improve governance through data-driven public service delivery. AI also enables manufacturing industries to enhance production efficiency, implement predictive maintenance, optimize supply chains, and improve product quality, thereby increasing industrial competitiveness in global markets. The growing availability of cloud computing, mobile technologies, high-speed internet, and affordable digital platforms has created new opportunities for AI adoption in emerging markets. Cloud-based AI services reduce the need for expensive computing infrastructure, allowing organizations with limited resources to access advanced analytical capabilities. Similarly, the expansion of mobile connectivity has generated large volumes of digital data that support AI-driven applications in banking, e-commerce, healthcare, agriculture, and public administration. These technological developments have significantly lowered the barriers to AI adoption for businesses and governments in developing economies. Governments are increasingly recognizing AI as a strategic priority for national development and economic competitiveness. Several developing countries have introduced national AI strategies, digital transformation initiatives, innovation policies, and startup support programs aimed at fostering technological advancement and improving digital capabilities. Investments in digital infrastructure, skill development, research institutions, and public-private partnerships are helping create innovation ecosystems that encourage AI research, entrepreneurship, and industrial modernization. International organizations, including the United Nations, the World Bank, and regional development agencies, are also supporting AI adoption through funding, technical assistance, and capacity-building initiatives that promote inclusive and responsible innovation. However, successful AI adoption requires more than technological investment. Organizations must address issues related to workforce readiness, organizational culture, change management, and ethical governance. The shortage of AI professionals, data scientists, software engineers, and digital specialists remains a major

challenge in many developing economies. Consequently, investments in education, vocational training, digital literacy, and lifelong learning have become essential for developing the human capital needed to support AI-driven transformation. Furthermore, transparent regulatory frameworks, robust data protection laws, and ethical AI governance are necessary to build public trust and ensure that AI systems are deployed responsibly and equitably. The emergence of generative AI, explainable AI, edge computing, federated learning, and intelligent automation is expected to further expand AI adoption across developing economies. These technologies offer cost-effective and scalable solutions that can help overcome traditional barriers associated with infrastructure limitations and technical complexity. By enabling localized decision-making, reducing dependence on centralized computing resources, and improving accessibility, these innovations can support more inclusive digital transformation across urban and rural communities. Although AI adoption in developing economies is accompanied by significant challenges, it also represents a unique opportunity to accelerate economic growth, enhance industrial productivity, improve public services, and promote sustainable development. Realizing these benefits requires coordinated efforts from governments, businesses, academic institutions, and international organizations to strengthen digital infrastructure, foster innovation, develop skilled human resources, and establish effective governance frameworks.

#### **Artificial Intelligence Adoption: Theoretical Perspectives**

The adoption of Artificial Intelligence (AI) within organizations is a complex process influenced by technological capabilities, organizational readiness, environmental conditions, and human behavior. AI implementation extends beyond the acquisition of advanced technologies; it requires organizations to transform business processes, develop new competencies, establish appropriate governance structures, and foster a culture that supports innovation. Consequently, researchers have proposed several theoretical frameworks to explain the factors that influence the adoption, implementation, and diffusion of AI technologies. These theories provide valuable insights into why some organizations and countries adopt AI more rapidly than others and how technological innovation contributes to organizational and economic transformation, particularly in developing economies. **Technology Acceptance Model (TAM)**, developed by Davis (1989). TAM suggests that an individual's intention to use a technology is primarily determined by two factors: **perceived usefulness** and **perceived ease of use**. In the context of Artificial Intelligence, organizations are more likely to adopt AI solutions when managers and employees believe that these technologies improve productivity, enhance decision-making, reduce operational costs, and are relatively easy to learn and integrate into existing workflows. Perceptions regarding system reliability, transparency, and user friendliness significantly influence employee acceptance of AI-enabled applications. Numerous studies have confirmed that perceived usefulness remains one of the strongest predictors of AI adoption across both public and private sectors. **Technology–Organization–Environment (TOE) Framework**, introduced by Tornatzky and Fleischer (1990). The TOE framework explains technology adoption through three interconnected dimensions: technological factors, organizational factors, and environmental factors. Technological factors include system compatibility, complexity, security, and relative advantage; organizational

factors encompass leadership support, financial resources, organizational size, digital capabilities, and employee skills; while environmental factors include competitive pressure, government regulations, industry characteristics, and external technological infrastructure. The TOE framework is particularly useful for studying AI adoption in developing economies because it recognizes the combined influence of internal organizational readiness and external institutional conditions. The **Diffusion of Innovation (DOI) Theory**, proposed by Rogers (2003), provides another important perspective on AI adoption. According to this theory, innovations spread gradually through social systems based on five key attributes: relative advantage, compatibility, complexity, trialability, and observability. AI technologies that demonstrate clear business benefits, align with organizational objectives, can be tested before full implementation, and produce visible performance improvements are more likely to be adopted successfully. Rogers also categorizes adopters into innovators, early adopters, early majority, late majority, and laggards, helping explain differences in AI adoption rates across industries and countries. The **Unified Theory of Acceptance and Use of Technology (UTAUT)**, developed by Venkatesh et al. (2003), extends earlier technology acceptance models by incorporating additional behavioral and organizational factors. The model identifies **performance expectancy, effort expectancy, social influence, and facilitating conditions** as primary determinants of technology adoption. In AI implementation, employees are more likely to embrace intelligent systems when they expect improved job performance, receive organizational support, have access to adequate training, and observe positive attitudes toward AI among colleagues and organizational leaders. The **Resource-Based View (RBV)** explains AI adoption from the perspective of organizational resources and capabilities. According to RBV, sustainable competitive advantage arises from valuable, rare, inimitable, and non-substitutable resources. AI technologies, high-quality datasets, skilled human capital, analytical capabilities, and digital infrastructure represent strategic resources that enable organizations to develop unique competencies. Firms possessing these resources are better positioned to implement AI successfully, improve operational efficiency, and create long-term competitive advantages. In developing economies, investment in digital infrastructure and workforce capabilities is therefore essential for maximizing the strategic value of AI. The **Dynamic Capabilities Theory** complements the Resource-Based View by emphasizing an organization's ability to continuously adapt to rapidly changing business environments. AI adoption requires organizations not only to acquire technological resources but also to integrate, reconfigure, and upgrade these resources in response to technological change and evolving market conditions. Dynamic capabilities such as organizational learning, innovation management, knowledge sharing, and strategic flexibility enable firms to continuously improve AI systems and respond effectively to emerging opportunities and challenges.

### **Current Status of AI Adoption in Developing Countries**

Artificial Intelligence (AI) adoption in developing countries has accelerated significantly over the past decade, driven by rapid digitalization, expanding internet connectivity, increasing smartphone penetration, and growing investments in digital infrastructure. Governments, businesses, academic institutions, and international organizations are increasingly recognizing AI as a strategic technology capable of improving economic productivity, enhancing public

service delivery, and fostering sustainable development. Although the level of AI adoption varies considerably across regions, many developing economies have begun integrating AI into key sectors such as healthcare, agriculture, manufacturing, finance, education, logistics, and public administration. These developments indicate that AI is gradually becoming an essential component of national digital transformation strategies.

Several developing economies have introduced national AI policies and innovation frameworks to strengthen technological competitiveness and attract investment. Countries such as India, Brazil, Indonesia, Vietnam, South Africa, Kenya, Nigeria, and the United Arab Emirates have launched initiatives to promote AI research, encourage startup ecosystems, develop digital infrastructure, and improve workforce capabilities. Governments are increasingly investing in digital public infrastructure, cloud computing, broadband expansion, and research collaborations to create favorable conditions for AI innovation. These initiatives demonstrate growing recognition that AI can contribute significantly to economic diversification, industrial modernization, and inclusive growth.

The private sector has emerged as a major driver of AI adoption. Large enterprises are implementing AI-powered solutions to optimize production processes, improve customer service, strengthen supply chain management, and enhance decision-making through predictive analytics. Financial institutions employ AI for fraud detection, credit scoring, risk management, and personalized banking services. E-commerce companies utilize recommendation systems, demand forecasting, and customer behavior analytics to improve operational performance and customer satisfaction. Manufacturing organizations are increasingly adopting intelligent automation, predictive maintenance, and quality inspection systems to enhance productivity and reduce operational costs.

Small and medium-sized enterprises (SMEs), which account for a substantial share of employment and economic activity in developing economies, are also beginning to adopt AI technologies. Cloud-based AI platforms, software-as-a-service (SaaS) solutions, and affordable digital tools have reduced the cost of AI implementation, enabling SMEs to access intelligent business applications without investing heavily in expensive infrastructure. AI is being used to automate administrative tasks, improve inventory management, optimize marketing campaigns, analyze customer preferences, and support financial planning. However, adoption among SMEs remains uneven because of financial limitations, limited technical expertise, and restricted access to high-quality data.

AI has demonstrated considerable potential in transforming the **healthcare sector** in developing countries. Intelligent diagnostic systems, medical image analysis, telemedicine platforms, disease surveillance, and predictive health analytics have improved healthcare accessibility, particularly in underserved and rural regions. AI has also supported public health initiatives by assisting governments in disease monitoring, epidemic prediction, healthcare resource allocation, and vaccination planning. These applications have strengthened healthcare systems by improving diagnostic accuracy and enabling faster clinical decision-making.

In the **agricultural sector**, AI technologies are helping farmers improve productivity through precision farming, crop monitoring, pest detection, irrigation management, soil analysis, and yield prediction. Satellite imagery, drones, and AI-powered mobile applications provide

farmers with real-time recommendations regarding weather conditions, fertilizer application, disease prevention, and resource management. Such innovations contribute to improved food security while reducing production costs and environmental impact.

The **education sector** has also witnessed increasing AI adoption through intelligent tutoring systems, adaptive learning platforms, automated assessment tools, and virtual learning assistants. AI enables personalized learning experiences by analyzing student performance and recommending customized educational content. These technologies have become particularly valuable in expanding access to quality education in remote and underserved communities while supporting teachers through administrative automation and learning analytics.

Financial inclusion has improved considerably through AI-enabled **financial technology (FinTech)** solutions. Digital payment systems, mobile banking platforms, AI-based credit assessment, fraud detection, and customer support chatbots have expanded access to financial services for individuals and small businesses previously excluded from traditional banking systems. AI-powered financial services have played an important role in promoting entrepreneurship, supporting microfinance institutions, and improving economic participation across developing regions.

### **Conclusion**

Artificial Intelligence has emerged as a transformative technology with the potential to accelerate economic growth, enhance industrial productivity, improve public services, and promote sustainable development in developing economies. Although the pace of AI adoption varies across countries, governments, businesses, academic institutions, and international organizations are increasingly recognizing its strategic importance in driving digital transformation and strengthening global competitiveness. Applications of AI in healthcare, agriculture, education, manufacturing, financial services, and public administration demonstrate its capacity to improve operational efficiency, support evidence-based decision-making, and address critical socio-economic challenges. AI in developing economies continues to face several barriers. Limited digital infrastructure, inadequate financial resources, shortages of skilled professionals, poor data quality, cybersecurity risks, regulatory uncertainty, and ethical concerns remain significant obstacles to large-scale implementation. Small and medium-sized enterprises, which form the backbone of many developing economies, often struggle to adopt AI because of resource constraints and limited technical expertise. Addressing these challenges requires coordinated efforts to strengthen digital ecosystems, improve internet connectivity, expand research and innovation capacity, and develop a highly skilled workforce capable of supporting AI-driven transformation. Government policies and institutional support play a crucial role in accelerating AI adoption. Investments in digital infrastructure, education, research and development, startup ecosystems, and public-private partnerships can create an environment that encourages innovation and responsible AI deployment. At the same time, transparent regulatory frameworks, robust data protection laws, ethical governance mechanisms, and international collaboration are essential for ensuring that AI technologies are implemented safely, fairly, and sustainably. Building public trust through explainable and accountable AI systems will further encourage organizations and citizens to embrace intelligent technologies. Looking ahead, advances in generative AI, explainable AI, cloud computing,

edge computing, and intelligent automation are expected to lower adoption barriers and make AI solutions more accessible to developing economies. These emerging technologies offer opportunities to improve productivity, foster innovation, expand financial inclusion, modernize industries, and enhance the quality of public services. As digital infrastructure and human capital continue to improve, developing countries will be better positioned to integrate AI into their economic and social development strategies. Artificial Intelligence should be viewed not merely as a technological innovation but as a strategic enabler of inclusive and sustainable development. The successful adoption of AI depends on balancing technological advancement with investments in human capital, institutional capacity, ethical governance, and digital infrastructure. Countries that adopt a collaborative approach involving governments, industry, academia, and international organizations will be better equipped to harness the full potential of AI, strengthen economic resilience, and achieve long-term sustainable growth in the digital era.

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