

Artificial Intelligence in Algeria: Between Reality and Ambition

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ABSTRACT

Artificial intelligence (AI) has emerged as a transformative driver of economic development, innovation, and global competitiveness. While many developed and emerging economies have advanced rapidly in AI adoption, Algeria remains at an early but promising stage, supported by institutional initiatives, university programs, and scattered sectoral applications. However, progress is constrained by structural barriers, including limited digital infrastructure, insufficient funding, gaps in human capital, and the absence of a comprehensive national AI governance framework. Using a descriptive–analytical methodology supported by recent data from international bodies (IMF, Oxford Insights, ITU), this paper examines global AI trends, analyzes Algeria's current readiness, identifies structural constraints, and highlights opportunities for national development. The study concludes by proposing a strategic roadmap (2025–2035) to accelerate AI integration and strengthen Algeria's position within the regional digital transformation landscape.

Introduction

Artificial Intelligence (AI), defined as machines mimicking human cognitive functions, is a transformative force in global technology and competitiveness. It is broadly categorized into two types: Narrow AI, which excels at specific tasks, and the theoretical General AI, which would possess human-like cognitive abilities. The recent surge in AI adoption across industries is driven by increased computing power, vast data availability, and advanced algorithms like machine learning and computer vision. Economically, AI is considered a "General Purpose Technology" with key characteristics: it enhances prediction and decision-making, relies heavily on human expertise and data (making it an intangible asset), and its benefits are often tied to who controls the necessary data. This global momentum raises a critical question about the position of nations like Algeria in the AI race. The central inquiry is how Algeria can transition from isolated initiatives to a structured national strategy, a move that requires analyzing its current position, opportunities, and the obstacles it must overcome.

1. Concept of Artificial Intelligence

Artificial intelligence is commonly defined as the capability of machines or computer systems to perform tasks that normally require human intelligence, such as reasoning, learning, perception, decision-making, and natural language understanding. According to Aghion, Jones, and Jones (2019), AI can be described as “an agent’s ability to achieve goals in a wide range of environments,” emphasizing autonomy and adaptability in its operations.

The concept of AI has evolved significantly over time. Traditional AI relied on rule-based systems, while modern AI relies on machine learning techniques that allow systems to improve through data exposure. Generative AI represents a new frontier, allowing machines not only to classify or predict but also to create new content, designs, code, or knowledge.

AI is also conceptualized as a general-purpose technology with widespread economic and social implications (OECD, 2023). This classification results from the technology’s scalability, cross-sector applicability, and ability to improve over time. Unlike earlier automation technologies, AI enables machines to perform cognitive tasks, expanding the boundaries of what can be automated.

AI’s conceptual foundation also includes its potential role in knowledge production. Aghion et al. (2019) argue that AI may accelerate the innovation process itself by helping researchers discover patterns, test hypotheses, and develop new scientific solutions. This unique characteristic differentiates AI from previous technologies, positioning it as a catalyst for both technological and scientific advancement.

Artificial intelligence is defined as a branch of computer science, the science that makes machines think like humans, meaning a computer with a mind. It is also defined as computer programs characterized by certain behaviors and properties that allow them to mimic human mental capacities and their modes of operation; among the most important of these properties are the ability to learn and deduce, and to react to situations they were not programmed for. Consequently, these are systems and devices that mimic human intelligence to perform tasks, and which can improve themselves based on the information they gather. (Hanaa, 2021, p. 573)

Looking at the most common applications today, artificial intelligence can be defined as "systems that use techniques capable of collecting data and using it to predict, recommend, or make decisions with varying levels of autonomy, and to test the best course of action to achieve specific goals." (Boutillier and other, 2015, p. 8)

2. General Importance of Artificial Intelligence

AI’s importance stems from its influence on productivity, innovation, decision-making, and societal development. McKinsey (2023) estimates that generative AI alone could contribute between **\$2.6 trillion and \$4.4 trillion** in annual global economic value. This impact is driven by several factors:

2.1 Enhancing Productivity: AI automates routine and repetitive tasks, allowing workers to focus on higher-value activities. According to McKinsey (2023), generative AI could increase annual labor productivity by **0.1–0.6 percentage points** through 2040. These gains depend on adoption rates, workforce skills, and regulatory frameworks.

2.2 Improving Quality of Decisions: AI systems analyze vast datasets more quickly and accurately than humans, enabling organizations to identify trends, forecast outcomes, and optimize processes. This results in better strategic decisions across sectors such as finance, transportation, and healthcare (OECD, 2023).

2.3 Supporting Innovation: AI enhances research and development (R&D) by accelerating experimentation, identifying new scientific relationships, and reducing development cycles. Firms using AI experience stronger innovation output and improved product development (Babina et al., 2023).

2.4 Enabling Personalization and Automation

AI enables advanced personalization in customer services, healthcare treatments, and educational platforms. It also supports intelligent automation across industries, improving operational efficiency and reducing costs.

2.5 Transforming Labor Markets: AI affects labor markets through job displacement, job creation, and skill transformation. While some occupations may decline due to automation, others emerge in areas such as data science, machine learning engineering, AI ethics, and cybersecurity (OECD, 2023).

3. Importance of AI in the Economy: Artificial intelligence is reshaping modern economies in structural and dynamic ways. This section examines AI's impact at macroeconomic, sectoral, and firm levels.

3.1 AI and Economic Growth: AI contributes to long-term economic growth through its role as a general-purpose technology. According to the NBER study by Aghion, (Jones, and Jones 2019), AI represents the latest wave of automation, enabling machines to perform cognitive tasks previously exclusive to humans. As AI takes over more tasks, total output can increase even without proportional increases in labor or capital.

AI also accelerates technological innovation, which is a key driver of economic growth. By improving R&D productivity, AI can expand the technological frontier faster than traditional innovation methods.

3.2 AI and Productivity Growth: Empirical studies show that AI adoption is associated with significant productivity gains. (The McKinsey 2023) report highlights that AI tools improve operational efficiency in customer service, marketing, software development, and R&D. OECD (2023) findings also show that firms integrating AI into production processes experience higher output and better resource allocation.

3.3 AI and Labor Market: AI significantly influences the structure of labor demand. The OECD (2023) reports that high-skill jobs in engineering, data science, and management experience increased demand, while mid-skill routine jobs face higher automation risks. However, AI also creates new job categories and hybrid roles combining human expertise with AI systems, suggesting complementarity rather than pure substitution.

3.4 AI at the Firm Level: Competitiveness and Growth

Firm-level studies show substantial benefits from AI adoption. Babina, Fedyk, He, and Hodson (2023) find that AI-adopting firms experience:

- higher employment growth,
- increased sales revenue,
- accelerated innovation output, and
- better market valuations.

4- Key Uses of Artificial Intelligence: AI technologies are being deployed across nearly every sector of the modern economy. The following section categorizes major applications.

4.1 Business and Industry Applications: AI is widely used in business operations, including:

- **Customer service:** chatbots, automated call centers, personalized responses.
- **Marketing and sales:** customer segmentation, pricing optimization, demand forecasting (McKinsey, 2023).
- **Software engineering:** code generation, debugging, system optimization.
- **Human resources:** candidate screening, performance prediction, workforce planning.
- **R&D:** product simulation, data-driven research, market analysis.

4.2 Manufacturing: AI supports smart manufacturing systems that integrate robotics, predictive maintenance, supply chain optimization, and quality inspection. These applications reduce costs, increase output, and improve efficiency.

4.3 Finance and Banking

Banks use AI for:

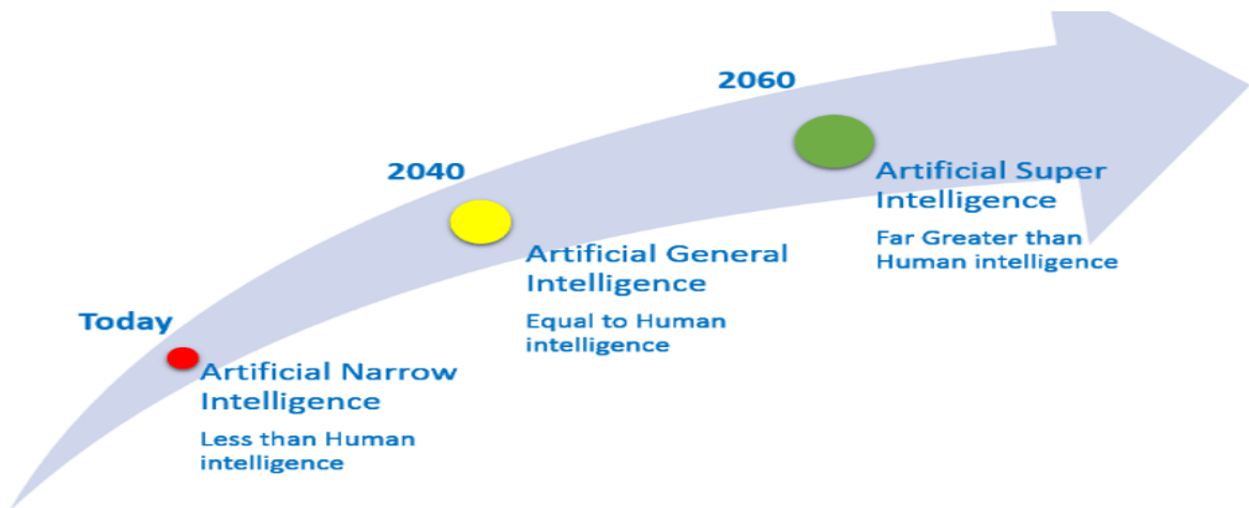
- fraud detection and prevention,
 - credit scoring,
 - algorithmic trading,
 - customer risk assessment.
- AI improves accuracy while reducing operational costs (OECD, 2023).

4.4 Healthcare: AI in healthcare includes diagnostic imaging, drug discovery, treatment planning, patient monitoring, and personalized therapies. AI enables early detection of diseases and more effective medical interventions.

4.5 Public Sector and Governance: Governments apply AI in public administration, digital identity systems, tax administration, transportation management, smart infrastructure, and security systems.

4.6 Education: AI enhances adaptive learning systems, personalized tutoring, automated assessment, and predictive analytics to improve student performance and institutional efficiency.

Figure 1: Types of Ai



Source: R. Saracco, 2018

Type 2 (based on functionalities)

Purely Reactive: Reactive machines are basic in that they do not store ‘memories’ or use past experiences to determine future actions. They simply perceive the world and react to it. IBM’s Deep Blue, which defeated chess grandmaster Kasparov, is a reactive machine that sees the pieces on a chess board and reacts to them. It cannot refer to any of its prior experiences, and cannot improve with practice.

Limited Memory: Limited Memory machines can retain data for a short period of time. While they can use this data for a specific period of time, they cannot add it to a library of their experiences. Many self-driving cars use Limited Memory technology: they store data such as the recent speed of nearby cars, the distance of such cars, the speed limit, and other information that can help them navigate roads.

Theory of Mind: Psychology tells us that people have thoughts, emotions, memories, and mental models that drive their behaviour. Theory of Mind researchers hope to build computers that imitate our mental

models, by forming representations about the world, and about other agents and entities in it. One goal of these researchers is to build computers that relate to humans and perceive human intelligence and how people's emotions are impacted by events and the environment. While plenty of computers use models, a computer with a 'mind' does not yet exist. Examples like C-3PO R2-D2 from Star Wars Universe and Sonny in the 2004 film *I, Robot*

Self-Awareness

Self-aware machines are the stuff of science fiction, though many AI enthusiasts believe them to be the ultimate goal of AI development. Even if a machine can operate as a person does, for example by preserving itself, predicting its own needs and demands, and relating to others as an equal, the question of whether a machine can become truly self-aware, or 'conscious', is best left for philosophers. Examples like Eva in the 2015 movie *Ex Machina* and Synths in the 2015 TV series *Humans*.

5- Challenges Facing Artificial Intelligence: Despite its numerous benefits, AI faces several challenges:

- **Ethics:** Societies are confronted with significant ethical challenges regarding AI making decisions that impact human lives. Should AI systems be allowed to make critical decisions, such as determining who receives medical treatment?
- **Privacy:** AI systems process vast amounts of personal data, raising concerns about privacy violations, leading to stricter regulations such as the **General Data Protection Regulation (GDPR)** in the European Union.
- **Job Loss:** AI is expected to replace many jobs across various industries. Studies suggest that AI may displace up to 800 million jobs by 2030, but in contrast, it could create around 130 million new jobs.

6- The Future of Artificial Intelligence:

AI is expected to continue evolving and significantly impacting various industries. Some of the key future trends include:

- **AI in Climate Change:** AI will be used to analyze environmental data and propose innovative solutions for combating climate change.
- **Developments in General AI:** Research into General AI is expected to increase, potentially revolutionizing fields like medicine, education, and scientific research.

7-The Current Status of Artificial Intelligence in Algeria

As of late 2025, Algeria's artificial intelligence ecosystem remains in an early but rapidly evolving stage, with growing momentum driven by strategic policy decisions and institutional investments. Although the country still trails regional leaders such as the UAE, Saudi Arabia, and Morocco, recent developments demonstrate a clear shift from isolated experiments to a structured national effort.

7.1 Academic and Research Ecosystem: Higher education has emerged as the cornerstone of Algeria's AI capacity-building. The flagship institution is the National Higher School of Artificial Intelligence (ENSIA), established in Algiers in 2023, which offers specialized undergraduate and graduate programs in AI, data science, and robotics (MESRS, 2024). By 2025, 74 master's-level AI programs are operational across 52 universities and grandes écoles, producing approximately 5,000 AI-skilled graduates annually (MESRS, 2024). Twelve dedicated AI research laboratories are now active in major academic centers including Algiers, Constantine, Oran, Annaba, and Sidi Bel Abbès, resulting in 859 AI-related publications indexed in Scopus and Web of Science during 2024 (AI World Society, 2025).

7.2 Emerging Startup Landscape

Algeria hosts an estimated 50–60 active AI or AI-enabled startups as of mid-2025, primarily focused on:

- E-commerce and logistics optimization (e.g., Yassir, TemTem)
- Fintech and digital payment solutions
- Precision agriculture and water-management systems

- Local-language natural language processing (e.g., DeepMinds DZ's Darija-large language model achieving 85% dialect accuracy)

Funding remains modest compared to regional peers, yet notable advances include the \$11 million AI, cybersecurity, and robotics investment fund launched by Algérie Télécom in 2025 (Algérie Télécom, 2025) and increasing engagement from international accelerators such as Flat6Labs Algiers and Startupbootcamp Afrinetech (Tech In Africa, 2025).

7.3 Government Strategy and Institutional Framework

The most decisive development has been the integration of AI into the Digital Algeria 2030 agenda under the High Commission for Digitalization (Haut Commissariat à la Numérisation, 2024). Key elements include:

- Adoption of a dedicated National Artificial Intelligence Strategy targeting a 7% contribution to GDP from AI and emerging technologies by 2027 (Haut Commissariat à la Numérisation, 2024)
- Creation of a National AI Council to coordinate cross-ministerial implementation
- Ongoing partnerships with global technology providers (Huawei, NVIDIA, Google Cloud) for AI competence centers and cloud infrastructure (Oxford Insights, 2024)

Concrete public-sector deployments are already underway: AI-assisted radiology systems in 15–20 university hospitals (MESRS, 2024), facial-recognition infrastructure at Houari Boumediene International Airport launched in December 2025 (Établissement de Gestion des Services Aéroportuaires [EGSA], 2025), and predictive flood-warning systems in Ghardaïa that have reduced risk exposure since 2021 (Direction Générale de la Protection Civile, 2024).

In conclusion, while Algeria's AI ecosystem remains nascent in scale, the convergence of expanded academic training, a burgeoning startup scene, and—most importantly—an explicit, government-backed national strategy signals a pivotal transition from awareness to systematic action (Tortoise Media, 2024; World Bank, 2024). These foundations position Algeria to gradually strengthen its standing within both the MENA and broader African AI landscapes.

8. Opportunities Available in Algerian Artificial Intelligence

Algeria stands at the cusp of a paradigm shift, with its demographic dividend and geographical location positioned in such a manner that the country can tap into the power of Artificial Intelligence in order to attain sustainable development. The potential of Artificial Intelligence can go beyond the boundaries of technology; it can be the means to overcome several economic challenges in the country, lead towards greater equity in society, and accelerate the attainment of several key development milestones in the country. Estimates predict that in the year 2030, Algeria can potentially increase its GDP by 5-7% through strategic deployment of Artificial Intelligence.

8.1 Catalyzing Economic

In these regards, AI represents an essential tool in the shift towards building greater strength in the economy in Senegal. In the industrial segment, predictive intelligence and process automation facilitated by AI can help optimize industries and increase industrial output based on successful pilot projects in other emerging countries. The tourist industry, replete with untapped cultural and historical resources, can experience a revival through the use of AI in customized travel and virtual tours, thereby opening up vast potential earnings. At the same time, the services sector, including fintech and logistics, stands ready to be disrupted. AI tools such as automated risk analysis and smart routing can easily produce many new employment opportunities through the exploitation of Senegal's growing digital economy.

8.2 Transforming Public Service Delivery and Resource Management

AI offers the prospect of entirely changing the manner in which the government operates through the adoption of data-driven decision-making in the public sector. Areas such as the distribution of water

and electricity, where inefficiencies and shortages frequently occur, can gain significantly from smart grids and the Internet of Things sensor network, resulting in less waste of these resources. At the municipal level, the government can eliminate delays in administration through the deployment of AI-driven virtual assistants in tasks such as the issuance of permits and responding to citizen queries. In the agricultural sector, which sustains employment or food security, AI-driven precision farming can optimize water consumption and boost agricultural output, especially in drier parts of the country, thereby ushering in new markets in terms of exports.

8.3 Reimagining Education in the Digital Age

Although Algeria has an impressively high literacy level, there are challenges faced by the education sector in terms of availability and quality. Here, AI can play an important role in closing these divides through scalable and personalized learning. Adaptive learning environments can customize educational materials according to the needs of individual students. In addition, this technology can be applied to help in multi-lingual education as well as in the early detection of underperforming students in order to ensure enhanced education standards. Also, in terms of future workforce requirements, the inclusion of AI simulations in vocational education, especially in areas of rapid growth such as renewable power, shall play an important role in matching educational standards to market requirements and in effectively tackling the issue of youth unemployment.

8.4 Pioneering Next-Generation

The Algerian healthcare sector, at times pushed to its limits or beyond, can leverage the capabilities of AI in terms of diagnostics and effectiveness to offer much-improved patient care. AI can help in the analysis of medical images in under-resourced settings like rural clinics, leading to much-improved diagnostics. Telehealth with AI can lead to vastly increased accessibility in terms of medical care, reducing travel costs and potentially lowering the rates of patient rehospitalization. AI capabilities in terms of predictive analysis can lead to much-improved government public health initiatives in responding to threats in terms of epidemiologic outbreaks, as shown in current global scenarios.

In conclusion, the adoption and integration of artificial intelligence can mean so much more than technology, because of its potential influences in terms of economic diversification, service delivery, education, and healthcare. To actualize these influences, there will be need to invest in all these aspects and ensure there is an ethical approach towards equitably using the benefits of artificial intelligence so that Algeria can emerge as a strong digital economy in the face of intense global competition in the North African region.

9. Statistics and Digital Facts on Algeria's Efforts in Artificial Intelligence

Algeria's integration of artificial intelligence, operating within the broader "Digital Algeria 2030" strategy, demonstrates measurable, though uneven, progress by mid-2025. While strategic investments are yielding results in specific sectors, the nation continues to grapple with foundational challenges in infrastructure and talent retention that risk curbing long-term growth. This section consolidates key metrics to provide a data-driven snapshot of the current state of AI in Algeria.

9.1 Financial and Academic Foundations.

The financial commitment to AI is evident, though it often falls under wider digital transformation budgets. In 2025 alone, approximately 1.5 billion Algerian dinars (~\$11 million USD) were directed towards AI, cybersecurity, and robotics, contributing to a cumulative investment of around 50 billion dinars (~\$370 million USD) between 2020 and 2024. This represents a significant 25% year-on-year increase, with the government targeting over 500 projects by 2026. Academically, the foundation for AI innovation

is strengthening. The Ministry of Higher Education and Scientific Research (MESRS) now dedicates 10-15% of its R&D budget to AI. This investment supports a growing network of 12 specialized research centers across major universities, which collectively produced 859 peer-reviewed AI publications in 2024—a notable 40% increase from the previous year.

9.2 Practical Applications: Healthcare, Security, and the Economy

The Regarding the healthcare industry, the use of AI technology is in the pilot phase but demonstrates positive outcomes. AI technology for analysis in the radiology department has been implemented at 15-20 university hospitals, where algorithms developed in-house in local Algerian universities such as Bab Ezzouar University have a detection accuracy of up to 90% in cancer cases, outperforming previous methods. In the context of the pandemic, an online predictive model at the University of Tlemcen has already reduced the analysis time of epidemiological evidence by 35%, and subsequent use of such technology has already resulted in a cumulative delay reduction of 25% in disease monitoring. At present, these smart technologies are limited, reaching merely 10% of public hospitals, revealing an important scalability barrier. The security department has already experienced real benefits from direct AI technology integration. The deployment of more than 50 facial recognition technologies at strategic airports and border protection checkpoints has resulted in a 25% reduction in forgery cases of documents. In cybersecurity protection, AI technology has already shown increased tool effectiveness, succeeding in repelling 65% of cyberattacks against government departments in 2024, up from 50% in the previous year. In terms of economic benefits, AI technology has already demonstrated increased effectiveness in main services. In the banking sector, chatbots using AI technology introduced by main state-run banks have automated up to 70% of repetitive queries at merely 70% of costs in customer services, reducing main costs by up to 20%. In agriculture, an intelligent irrigation network in Blida has already demonstrated water savings of up to 15-20% in water consumption through smart irrigation management.

9.3 The Human Capital Pipe and Its Leaks

Initiatives in education are laying strong grounds for developing indigenous talent. The "DZ e-Learning" portal has so far acquired more than one million users, and its AI-based optimization has resulted in an increase in completion rates of courses by 20 to 25 percent. Each year, approximately 5,000 candidates complete AI-related fields, which is an unprecedented rise made easier by the existence of 74 master-level specialized programs. In spite of such rapid development, the most alarming situation that the country confronts in the AI industry regards "brain drain." Each year, 35 percent of AI experts move abroad because of the lack of jobs in the domestic market, while the unemployment level in the technology industry stands at 30 percent.

9.4 Persistent Structural Hurd

There are two significant structural issues potentially hindering the progress being made. One is the digital divide, where about 60% of rural zones do not have high-speed connectivity, thereby keeping them out of the AI network. The other issue is innovation financing; less than 15% of estimated 50-60 AI startups have received government support in 2024, thereby looking towards other sources of financing. Conclusion: Although Algeria has started the AI process in a positive manner, with increased academic publications, success in security applications, and increased expertise, whether or not the country can meet its target of 7% GDP contribution in 2027 rests in dealing with its challenges in innovation financing, infrastructure, and most importantly, the talent retention issue.

Table n 01 : **The Government AI Readiness Index 2024**

Rank	Country	Region	Overall Score (out of 100)
1	United States	North America	87.03
2	Singapore	East Asia	86.21
13	United Arab Emirates	Middle East & North Africa	72.54
52	Egypt	Middle East & North Africa	55.63
69	Mauritius	Sub-Saharan Africa	53.94
71	Tunisia	Middle East & North Africa	53.27
72	South Africa	Sub-Saharan Africa	52.91
80	Morocco	Middle East & North Africa	50.81
130	Algeria	Middle East & North Africa	40.25

Source : <https://www.oxfordinsights.com/ai-readiness-index-2024>

The information provided in the Government AI Readiness Index 2024, published by Oxford Insights, offers an in-depth analysis of how ready different governments are in terms of applying and using artificial intelligence effectively. In these 188 countries, the assessment takes into consideration the government vision, technology development, and data infrastructure. An analysis of the rankings in the Middle East and North Africa (MENA) region shows large gaps in readiness in terms of AI. The United Arab Emirates (UAE) stands out in the region and in the global rankings as an exemplary model in terms of readiness in AI. It was placed 13th with an AI readiness score of 72.54. It can be argued that such an exemplary performance places it in the elite nations and follows close to the leading nations in terms of readiness in AI, such as the United States (1st) and Singapore (2nd). In terms of the countries in North Africa, Egypt stands out as the leading country in the region. Egypt is positioned at 52 in the global rankings with an index score of 55.63. Egypt appears to have strong basics in place and an increased level of dedication towards building up its AI ecosystem. Egypt is trailed by Tunisia, which stands at 71 in the global rankings with an index score of 53.27, and then Morocco, which stands at 80 in the global rankings with an index score of 50.81. Algeria ranks 130th with a score of 40.25, which translates to the country being in the early stages of developing the national AI strategy. Algeria fares poorly compared to neighboring countries.

10. The Current State of AI Technology Adoption in Algeria:

To fully harness the benefits of AI in Algeria, significant efforts must be made, alongside overcoming various obstacles and challenges. (Sari Mohamed Fayza, 2025, P110)

3.1 Efforts by the Algerian Government in the Field of Artificial Intelligence:

AI is experiencing notable growth in Algeria, with both the government and private sector increasingly investing in this field.

Research centers and educational initiatives have been established to enhance AI capabilities. Additionally, Algeria is actively working to integrate AI technologies into key sectors such as healthcare, agriculture, and industry, aiming to drive economic and social development.

This section explores the initiatives undertaken by the Algerian government to leverage AI in advancing the national economy, particularly in the context of digital transformation across various

sectors. The Algerian government has long prioritized digitalization and data modernization, recognizing their essential role in the development of AI systems, in alignment with global trends. In 2018, a decision was made to establish the National Artificial Intelligence Strategy (2020– 2030), which introduced several key measures, including:

1 Establishment of the Artificial Intelligence Center (SKAILAB):

Established in February 2020 at the University of August 20, 1955, in Skikda, it is the first national center for artificial intelligence in Algeria. The center provides solutions to economic and industrial partners, as well as training experts in the fields of computer science and artificial intelligence. The center aims to achieve a number of goals, including:

- Establishing partnership communications with operators across various sectors.
- Organizing collaborative work with company managers to collect data and share expertise.
- Collecting, coding, and filtering data.
- Developing artificial intelligence models suitable for the available data.
- Training university researchers and entrepreneurs, which is the ultimate goal of the artificial intelligence center.
- Implementing, testing, and deploying advanced models.
- Assisting users in expressing their needs regarding management models and decision support.

2. The National Higher School of Artificial Intelligence (ENSIA): The National Higher School of Artificial Intelligence (ENSIA) is a prestigious higher education institution whose mission is to train engineers specializing in the theory and applications of artificial intelligence and data science. The establishment of ENSIA aims to fulfill responsibilities in the field of higher education, as well as in scientific research and technological development within its area of expertise.

3. The National Higher School of Mathematics (ENSM):

The National Higher School of Mathematics (ENSM) is equally important in the effort to develop artificial intelligence tools in Algeria. The school officially commenced its educational activities on October 12, 2021, with the objective of training highly skilled engineers in mathematics, providing support to major companies in Algeria, offering postgraduate training, and leading scientific research in the field. The world is currently undergoing a profound transformation with the advent of the digital revolution, also known as the Fourth Industrial Revolution, in which AI serves as the new driving force of the global economy. Studies predict that AI will contribute approximately \$15 trillion to global economic growth over the next ten years. Algeria is no exception to this trend, as it has the potential to boost its economy by nearly \$80 billion, based on population-based economic projections. More than 150 countries have adopted a national AI strategy, with some even establishing dedicated ministries for the sector. Meanwhile, the number of AI-

driven enterprises worldwide has increased by 270% over the past four years. Reports indicate that over 90% of leading companies have invested in AI to enhance productivity, applying its technologies across various sectors, from oil and gas to agriculture, manufacturing, and even tourism. Algeria has outlined national priorities in healthcare, food security, and energy security, integrating AI to reduce oil exploration costs and foster substantial growth in other strategic areas. Additionally, the country is striving to invest in data science and AI to improve planning, forecasting, and public services offered to citizens.

3.2 Challenges Facing AI Adoption in Algeria:

Despite Algeria's significant efforts to keep pace with digital transformation, the adoption of AI faces numerous challenges. These challenges can be summarized as follows:

3.3 The Level of Development of IT Infrastructure:

This is the primary and leading indicator, as it provides an overview of the availability of the technology and infrastructure necessary to support the application of artificial intelligence, such as internet bandwidth, data analysis centers, and others. The second indicator is the robustness of the sector, which includes the availability of talent and skills required to develop and implement artificial intelligence applications in practice. From the first indicator, it can be concluded that Algeria is still far from achieving this in the current period. Artificial intelligence applications are currently individual and collective projects, not "community projects," meaning they do not yet have the capacity for widespread use in various public services. From the second indicator, based on official and field data, it can be concluded that Algeria possesses a considerable "information infrastructure" base to implement this project. This is complemented by the third indicator, which concerns the availability of talent and skills in Algeria for executing projects in this field. Additionally, government initiatives are laying the foundation for interest in this area, such as the establishment of a graduate school for artificial intelligence in 2021, followed by the integration of artificial intelligence roles in various universities across the country. These initiatives aim to support various projects and innovations, transforming them into startups that will gradually contribute to the national economy. Notably, numerous reports predict that the Middle East and Africa will be the fastest-growing regions in the world in terms of artificial intelligence spending until 2026.

3.4 Slow Digital Transformation in Various Economic and Social Sectors:

Most of the activities in Algeria, including economic, industrial, and financial sectors, still suffer from the slow pace of digital transformation. More than five years have passed after announcing the need to adopt technology and digitization of economic and social sectors, yet progress in this direction is slow up to this day. A few sectors, like higher education and national education, try to hold abreast with the evolution that has taken place in technological areas.

However, the pace at which the country's leadership implements recommendations on its path toward complete digital transformation offers an opportunity for Algeria to join the top ranks in this sector with regard to artificial intelligence development, economic growth, and new job creation. and enhance the quality of public services. All this, however, requires a strong commitment from the government, private sector, academic community, and society as a whole. After all, artificial intelligence is just a tool, and how well this tool is used.

3.5 Legal and Regulatory Challenges:

As to Algeria, under the laws set up to regulate electronic transactions - Law 18/05 -, the Algerian Legislator did not tackle, whether in an explicit or implicit manner, artificial intelligence and its uses. This is a serious deficiency, particularly when compared to some Arab laws that have addressed AI indirectly, for instance, by validating electronic agent transactions or what some laws refer to as electronic intermediaries, as is the case with the United Arab Emirates.

Furthermore, Algeria is still lagging behind in terms of drafting specific regulatory texts aimed at the governance and ethics of artificial intelligence. That shortfall is reflected in the country's ranking on cybersecurity; Algeria ranked 105th in the world in 2023.

3.6 Cyber security Challenges:

Digital technologies in government pose new challenges in the field of cyber security and data protection, particularly in storing and exchanging sensitive data over networks. Despite Algeria's relatively recent move toward e-governance, the number of crimes committed suggests the scale of the risks it faces. This places Algeria in front of new challenges and obstacles, primarily achieving cyber security both now and in the future. The technological advancements and the emergence of the internet (Wi-Fi, 3G, 4G, 5G) require security authorities to rise to the challenge and be prepared with the latest technologies to confront and combat these developments.³ Additionally, the country faces transnational cybercrimes and wars, especially considering the external tensions along its borders, such as those with Libya, Mali, Niger, and Morocco.

3.7 Weaknesses in Algeria's Educational System:

Although there is technology infrastructure in Algeria, there are several challenges faced by the country in the education sector in terms of technology infrastructure gaps and inadequate teacher technology expertise. Furthermore, there appears to be a need to bridge the generations in terms of technology experience between the older generation of Algerians who are skilled in technology; there are many Algerians in this generation

and the younger generations, which affects the adoption of new technologies. In view of the fact that the standard of education has significant importance in the process of technology integration and utilization,

artificial intelligence has provided an important opportunity in terms of upgrading educational quality and the promotion of sustainable development in Algeria.

3.8 Weaknesses in Algeria's Healthcare System:

The adoption of artificial intelligence technology in the healthcare sector in Algeria cannot be compared to other neighboring countries because the adoption level in Algeria can be considered low in some of its university hospitals, such as in cancer diagnosis and surgery. The low adoption level of AI technology in the healthcare sector can be attributed to challenges faced by the sector in the country, such as the lack of proper information about the health of citizens, low standards of healthcare services delivered to citizens, and the failure to digitalize the healthcare sector.

Conclusion

Several countries around the world are developing national strategies for the development and use of AI across multiple sectors. The number of countries adopting AI technologies greatly increased between 2016 and 2020, with Brazil, India, Canada, Singapore, and South Africa being the fastest-growing in AI implementation.

AI-related job postings similarly grew from 2013 to 2020, with the average share of these jobs in all job postings in 2020 reaching about five times that of 2013.

On the investment front, investment in AI globally surged from \$12.7 million in 2015 to \$67.9 million in 2020, up 40% compared to the previous year. The US ranks first in the world in private investment in this sector, with China experiencing exceptional private investment in 2018 but falling to less than half of the US level of investment in 2020. It should be mentioned that public investment remains strong in China, as does government support, for AI research and development. Of course, there is a great difference in the degree of AI adoption for different sectors. In 2020, high-tech and telecommunications took the lead in this regard, with more than 70%, followed by the automotive, assembly, and financial services sectors at 60%. Then comes business, legal, and professional services, healthcare and pharmaceuticals, and lastly consumer goods and retail. While substantial gains are already being realized as a result of digital transformation and the positive impact of AI across sectors, experts predict that with greater automation and the rise of robots into new areas, some of the jobs of today will become obsolete. A further consequence that has been suggested is that there will be an increased divide between developed and developing countries, since developed nations will be better positioned to raise their profits through the use of AI.

Algeria views AI as a strategic lever for economic change. Though it has built some foundations through education and first applications, the country is facing several important challenges: low levels of digital

infrastructure, with 60% rural exclusion; remarkable brain drain with 35% of AI graduates; limited funding for startups; and several gaps in regulation.

To become a reality, infrastructure expansion needs to reach 80% 5G/fiber coverage by 2030; more importantly, investment in AI must be increased to \$50-100 million per annum, along with talent retention programs. These will, in fact, allow AI to contribute 5-7% of GDP, create high-value jobs, and reduce dependence on hydrocarbons.

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