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ADOPTING AI IN IRAQ

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Executive Summary

Iraq's economic challenges present a unique opportunity for adopting Artificial Intelligence (AI) in the industries sector. The country's continued and growing focus on the oil sector should be balanced by technological innovations to improve the industries sector. AI can be the answer to automate tasks, drive down costs, and transform businesses. In the meantime, Iraq should bridge the skills gap, invest in critical technical components, prioritize data integration while developing human talent to fully integrate AI in the industries sector. Even though Iraq currently lags behind other Middle Eastern countries in AI adoption, it can adopt AI-based technologies in critical sectors to stimulate the unrealized economic potential of its industries.

Overview

The economic condition of Iraq is undergoing hasty retreats. The country's unending cycle of devastating wars, political malpractice, and state-sponsored violence have had a lasting impact on the economy. The nation's staggering dependence on oil is a sure recipe for economic gridlock. The oil sector makes up 65 percent of Iraq's GDP and an even more substantial 92 percent of government revenue.[1] Fluctuations in oil prices have introduced ongoing economic difficulties that consistently result in budget shortfall. Strengthening the industries sector has sparked debate in the recent decade, though few have carved a roadmap as to how to implement capacity strengthening for this journey of industrial development in Iraq. However, realizing the full potential of the industries sector cannot be isolated from addressing the root causes of the current economic crisis. Boosting the economy through AI could be the single efficient platform to introduce countless development in the industries sector. However, the question is whether the Iraqi government would adopt AI and value a tech-driven economy to build these battled industries sector. Fortunately, Iraq can benefit from the AI initiatives of the regional economic powerhouses, like Saudi Arabia and the United Arab Emirates to gain insights on how to effectively integrate AI into the economy.

What is Artificial Intelligence?

Artificial Intelligence refers to a machine's ability to perform the cognitive functions we usually associate with human minds such as perceiving, reasoning, learning, interacting with an environment, problem solving, and even exercising creativity.[2] AI consists of a variety of technologies, including machine learning, deep learning, and natural language processing (NLP).[3] The types of AI[4] include:

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- Reactive: responds to different stimuli without using memory or learning from past experiences. Example: Chess-playing programs, spam filters, voice assistants.

- Limited memory: uses memory to learn and improve its responses based on previous data or actions. Example: Self-driving cars, facial recognition systems, chatbots, recommendation systems, sentiment analysis.

- Theory of Mind: Understands the needs, emotions, beliefs, and intentions of other intelligent entities, such as humans and animals. Example: None yet, but some potential applications are social robots and digital assistants.

- Self-Aware: Has human-like self-awareness and intelligence, and can reflect on its own actions, goals, and abilities. Example: None yet, but some hypothetical applications are artificial super intelligence, artificial consciousness, and artificial general intelligence.

AI vs. Machine Learning vs. Deep Learning[5]

Artificial Intelligence (AI): a program that can sense, reason, act and adapt.

Machine Learning (ML): algorithms whose performance improve as they are exposed to more data over time.

Deep Learning (DL): subset of machine learning in which multilayered neural networks learn from vast amounts of data.

Is there "true" intelligence in AI technologies?[6]

Researchers disagree on what a true intelligent machine is. How we recognize "true" artificial general intelligence-which refers to a theoretical state in which computer systems will be able to achieve or exceed human intelligence, is still debatable.

However, AI capabilities, regardless of its "true" intelligence, open a variety of impactful real-world applications, such as in the business sector and supply chains, pattern recognition, predictive modeling, automation, object recognition, and personalization are some of the most common real-world applications of AI.

Measurable Impacts: Business, Supply Chains, Future Benefits

The most effective way to capture measurable impact of AI capabilities in the industries sector is through automating tasks. This is pivotal to save time, money, and resources while also reducing human intervention and errors. AI's general application pivots to the world of business and, specifically, supply chain resources and management. Through automating tasks, cutting expenses, and analyzing data to gain insights on prospects or shortfalls, AI has tremendously transformed the daily operations of companies. For instance, bolstering AI-based digital systems assists supply chain experts to monitor shipments, anticipate delays, and quickly resolve problems to guarantee the smooth movement of commodities around the globe[7]. The global market for AI is increasing exponentially and expanding from $136.6 billion in 2022 to $1.8 trillion in 2030.[8] As AI permeates every sector of the global economy, traditional businesses are struggling to keep up in the competition. This wave of AI industrial revolution in the economy is utilized in three main ways,[9] Including:

1. The capacity to quickly assess massive amounts of data and generate practical insights. Example: AI analytics that use machine learning to process large amounts of data.

2. Reduced labor expenses translate into a higher return on investment (ROI) for related services. This includes three main cost-effective solutions, such as:

▪ **Predictive maintenance:** Numerous manufacturers are integrating AI tools into their operations to forecast the intervals between machinery repairs and maintenance. By implementing this technology, a factory can proactively restore a machine to prevent downtime.

▪ **Maximize ROI:** Powered by smart predictions and the capacity to identify patterns, AI is exceptionally effective at identifying patterns to increase ROI and business efficiency.

▪ **Limit human error:** when AI is trained with high-quality data and is regularly updated to correct for drift does not make mistakes.

3. Improved customer satisfaction and experiences that may be customized to fit the demands of certain customers. Example: chatbots (NLP) and (NLG), automated call routing software, and sentiment analysis tool to understand the tone of over-the-phone conversations to see how customers feel and identify areas for improvement.

AI Readiness in Iraq

Aside from that, Iraqi industry sectors make minimal use of technology. However, a clear plan combined with (1) bridging the skills gap and (2) increasing adequate resources provide the necessary foundations for adopting AI technologies, introducing new jobs across industries and most significantly, building the industries' manufacturing power. Advancing AI technologies in Iraq is contingent upon the country's ability to build critical technical

components, especially in (1) algorithms, (2) computer hardware, and (3) data.[10] Iraq should prioritize the integration of data and recognize its potential as a valuable resource, akin to oil, to drive technological advancements in the industries sector. Just like oil fuels engines, data powers AI-based systems functioning as a valuable resource that can be collected, refined, and harnessed for practical applications.[11] The untapped transformative potential of AI could benefit Iraq significantly if the country makes substantial investments in constructing big data and nurturing human talent to manage it. While shifting away from reliance on oil and gas will take time, starting the process is critical to preventing Iraq from falling behind in the rapidly changing tech economies, just across from its borders.

Iraq in Comparison to MENA

AI contribution to the Middle East economy is expected to reach $320 billion putting the UAE on top of the economies of the region followed by Saudi Arabia.[12] The Middle East, even though growing and developing at different rates, will be awaiting significant transformations in the AI-driven business sector. As for Iraq, its low economic vitality is decades behind if compared to the rest of AI-invested Middle Eastern countries, such as the UAE, Saudi Arabia, and GCC4. These leading economies of the ME have invested substantial capital in producing accurate and reliable data to foster AI growth and maximize productivity. The UAE alone is set for promising growth by 36.2% and its AI market will reach $1.9 billion by 2026 while the total region combined will reach 47.7% annual growth by then.[13] according to Data Bridge Market Research, Iraq is looking at a low prospect for AI market growth reaching $1,582.04 million, or 12.7% by 2029.[14] The MENA economies are expected to make investments in the AI-driven economic sectors by 2030, as demonstrated in Table 3 below:

Sector	GDP Contribution by 2030 in the MENA
Retail	19.0%
Public	18.6%
Financial	13.6%
Transport	15.2%
Security and Defense	9.1%
Energy	6.0%

Table 1: GDP Contribution by 2030 in the MENA Region[15]

Industrializing the Agricultural Sector through AI

Given the challenges posed by climate change, the key to advancing agricultural practices in Iraq lies in embracing innovative solutions. Since 2003, Iraq has employed nuclear technology as a means of boosting its agricultural output as a response to the changing climate. Iraq has successfully developed a variety of drought-tolerant wheat with the assistance of the Food and Agriculture Organization of the United Nations (FAO) and the International Atomic Energy Agency (IAEA). Together with better water and soil management, this new draught-tolerant wheat has quadrupled yields, accounting for two thirds of Iraq's wheat production.[16] AI-based Crop monitoring, irrigation soil content sensing, crop establishment, weeding, and crop yield are some of the technological solutions that have helped farmers in various countries to increase yield with less input.[17]

AI proves especially beneficial for environmentally conscious agriculture in Iraq, given its arid climate and water scarcity. This is where AI becomes instrumental: innovations such as *precision agriculture* allow farmers to monitor crop moisture, soil composition, and temperature in cultivation areas. This information assists farmers in optimizing crop management, allowing them to determine the ideal amounts of water and fertilizer for enhanced yields.[18] Some examples of AI-powered solutions are demonstrated in Table 2.

Area of AI application	Brief explanation
Crop Yield prediction	Identify the output yield of the crop and forecast prices for the farmer to obtain maximum profit
Intelligent spraying	All sensors data and weather forecast are used to spray the right amount of pesticides and fertilizers
Insights on seeds	Analyze the quality and performance of seeds and recommend the best ones for the farmer
Autonomous robots	Perform tasks such as harvesting, weeding, pruning, and thinning using computer vision and machine learning
Crop and soil monitoring	Use drones, satellites, and sensors to collect data on crop health, soil moisture, and nutrient levels
Disease Diagnosis and Prediction	Detect and diagnose plant diseases and pests using image recognition and deep learning

Table 2: Types of AI in agriculture and areas of their application.[19]

With a surge of population increases in the Middle East, the ME countries aim to strengthen the agricultural sector through AI technologies. Rising food demand due to the negative impacts of climate change have factored in greater investment in innovative agricultural solutions to increase productivity. Food security is a hot topic as the estimated 329 million population increase by 2050 will also cause urbanization growth by 70 percent in the region.[20] A tech-driven agricultural sector presents creative solutions to address food security issues while promoting the AI- driven industrialization of the agricultural sector.

Tackling Major Hurdles Ahead

Iraq poses a distinct mix of challenges when it comes to integrating AI technology into its industries sector. Developing the industries sector plays a crucial role in the overall economic growth by raising the productive capacity of the people and creating ever-increasing employment opportunities.[21] One of the key areas of concern is the absence of accurate data for effectively assessing the potential of this sector and consequently boosting its economic

impact through the adoption of AI. The absence of a well-defined strategy for the adoption of AI could pose serious obstacles to Iraq's efforts to develop a tech-driven economy that will increase productivity and generate employment. By addressing the following challenges Iraq can significantly facilitate progress towards embedding a tech-driven economy:

| Obstacle	Impact	Consequence
💰 Corruption	Rampant corruption misallocates resources, obstructing fair and open tech initiatives.	❌ Waste of funds, opportunities, and reputation
🏗️ Infrastructure Deficit	Poor infrastructure hinders the implementation and availability of technology.	❌ Lack of access, reliability, and quality
🌐 Low Internet Access	Limited internet connectivity reduces the population's opportunity to benefit from technological innovations.	❌ Isolation, exclusion, and inequality
🎓 Education and Skills Gap	A lack of skilled workers results from inadequate education in technology-related fields.	❌ Shortage of talent, creativity, and competitiveness
🔢 Funding and Support Shortage	Insufficient financial support stifles research and innovation, limiting technological advancements.	❌ Slowdown of growth, development, and transformation

Table 3: Major obstacles to embedding a tech-driven economy in Iraq.

Conclusion

Iraq faces significant challenges in the industries sector that must be addressed to successfully adopt AI and drive economic growth. Addressing talent gaps and ensuring effective data integration, and preparing the infrastructure are crucial factors that need to be prioritized. Most importantly, Iraq's heavy dependence on the oil sector should be balanced by AI-driven innovation which would ensure "doing more with less" and guarantees increasing the productive capacity of its industries.

ENDNOTES

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