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The Influence of AI on the Caspian Region's Oil and Gas Industry

A Tale of Innovation and Geopolitical Nuances

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Ever since its humble beginnings in the nineteenth century, the oil and gas industry has become a vital part of the world. From providing heat in our houses and driving our cars to work every day to being a major contributor to the world economy, the oil and gas industry has become the backbone of modern life.

Once thought of as a slow-moving and conservative sector, the oil and gas industry is adapting to the Artificial Intelligence (AI) revolution that is on the way. The initial impact of the new technology is just the beginning of what will completely transform the industry. Many ask, "How is AI transforming the oil and gas industry?" We can provide an answer to this question through an interesting lens: the oil-rich Caspian region.

The Historical Epicenter: The Caspian Region's Legacy

To understand the region's importance, one must look at the historical context. Stretching between Azerbaijan, Kazakhstan, Turkmenistan, Iran, and Russia, the region has played a pivotal role in the industry's history. The first half of the nineteenth century marked the beginning of oil drilling using human- and horse-power in Baku, Azerbaijan.

The crucial role played by Caspian oil was especially highlighted in global events like World War II. This is exemplified by a famous picture of German Chancellor Adolf Hitler cutting a cake with the Caspian Sea and Baku's oil wells in the center,

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symbolizing his ambition to seize the oil fields in Azerbaijan, which ended up playing a vital role in the Soviet Union's victory against Nazi Germany.

This part of the world regained the world's attention after the breakup of the Soviet Union, providing new opportunities for the region.

The Caspian Sea: A Misunderstood Behemoth

The Caspian Sea is a global epicenter of untapped natural resources. Spanning 700 miles in length and containing six separate hydrocarbon basins, most of its oil and natural gas reserves have yet to be developed. Proven oil reserves in the Caspian region are estimated at 17-33 billion barrels, rivaling those in the United States (22 billion barrels) and the North Sea (17 billion barrels).

The geographical location is a huge allure of the region. As Nikolas Gvosdev wrote in the inaugural re-launched edition of *Baku Dialogues*, the region "interlinks not only the world's two most critically important regions (the Euro-Atlantic and Indo-Pacific basins), but also directly interconnects South Asia, the Middle East, and the Eurasian space with each other. [...] In geostrategic terms, this region is the geopolitical hinge where the North Atlantic Treaty Organization meets the Shanghai Cooperation Organization, and where the Belt and Road Initiative connects with the wider European neighborhood and the European Union itself." In other words, its positioning at the crossroads of Europe and Asia thus makes the region an important asset to world oil importers, acting as a gateway and conduit between different parts of the world. The combination of its geographical advantages and resource potential not only makes it a promising oil producer for the future, but it also makes the Caspian region a zone for advancing new technologies like AI.

Varied Business Models in the Caspian Oil and Gas Sector

The oil-producing states of the Caspian region have adopted diverse operational strategies, contributing to the region's complex geopolitical fabric. Azerbaijan, Kazakhstan, and Turkmenistan have opened their economies to foreign investments. Together with state involvement, foreign companies such as BP, Equinor, and Total play pivotal roles in their respective oil and gas industries.

The flip side is the contrasting industries of Iran and Russia. Iran's vibrant oil and gas industry has remained relatively insulated, and its output has declined since 2017, primarily due to sanctions and a lack of investment. Despite a general decline, Iran's sector is demonstrating its robustness. A pivotal development in this narrative has been Iran's strategic realignment towards China: this country is the linchpin in Iran's recent export growth, accounting for an astonishing 95 percent of Iran's crude oil exports. Driven by strong Chinese demand since 2021, which increased last year and

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has been sustained in 2024 (so far), Iran has adeptly increased its crude oil exports. May 2023 saw Iran's highest export numbers since 2018, a positive trend in Iran that is forecasted to continue in 2024.

Russia's involvement in the Caspian basin, primarily through its production in the North Caucasus, has also been significantly affected by the conflict over Ukraine and the imposition of a West-led sanctions and export restrictions regime. This last has led to a notable departure of major Western oil and gas foreign companies and a consequential decline in Russian energy revenues. As of 2024, Russia's oil and gas revenues have fallen to a three-year low.

The Geopolitical Significance of the Caspian Region

Strategically positioned between Europe and Asia, the Caspian region has gained significant geopolitical attention amidst the aforementioned conflict and imposed sanctions regime. This has led to a shift in focus toward the three other countries belonging to the core of the region (i.e., Azerbaijan, Kazakhstan, and Turkmenistan) as an alternative source of oil and gas. Key developments like the Southern Gas Corridor (especially if, as promised by the EU, its capacity is allowed to double) and the proposed Trans-Caspian pipeline are pivotal in reducing the reliance of Türkiye, the Western Balkans, and parts of the EU on Russian energy sources, thus enhancing the energy security of the countries concerned. The Southern Gas Corridor originates in Azerbaijan and extends into Georgia, Türkiye, Greece, and Albania before terminating in Italy, connecting in various places to existing pipelines that avoid Russian (and Ukrainian) territory. Furthermore, the proposed Trans-Caspian pipeline, intended to link Turkmenistan and possibly Kazakhstan to Azerbaijan, would also bypass Russia (and Ukraine) but also Iran. Its actualization, even in the form of an interconnector, would reinforce the strategic importance of the Southern Gas Corridor.

The Transformative Impact of AI in the Oil and Gas Industry

AI-driven technologies are starting to integrate themselves into most human activities. The oil and gas industry is experiencing a significant transformation with the integration of AI. According to a recent Ernst & Young survey, 92 percent of oil and gas companies worldwide are investing in AI or planning to do so in the next five years. And the impact of AI is already evident, as 50 percent of oil and gas executives are using it to solve challenges across their organization. This shift marks a departure from the industry's traditionally cautious approach to innovation.

AI brings a range of efficiencies to the sector, from improved raw material procurement and logistics to advanced geological assessments and seismic data analysis. One of the technology's key benefits is AI's ability to reduce operational downtime, saving significant costs by using predictive analytics for maintenance and resource management.

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AI's impact is also notable in optimizing exploration and production. By analyzing historical data, AI enables more strategic planning and efficient resource extraction. It also plays a crucial role in refining and marketing, optimizing operations, and enhancing supply chain management.

Innovative technologies like BIM [Building Information Modelling] Digital Twin, combining IoT, Big Data, and cybersecurity are being implemented to create virtual replicas of plants for real-time simulation. This AI technology boosts productivity and reduces costs by allowing companies to test different scenarios before undertaking complex projects.

The rise of AI-powered tools, such as Shell Lubricants' Shell LubeChat, a chatbot for B2B lubricant customers, exemplifies the industry's shift towards AI integration in customer service and product selection.

Despite fears of job losses, the rise of AI is expected to shift, not replace, human roles within the industry, leading to more complex and skilled tasks performed by humans. Moreover, AI's potential extends beyond operational efficiency to improving environmental sustainability and regulatory compliance, reflecting a commitment to safety and sustainable practices in the oil and gas sector.

AI in the Caspian Region: Advances and Complexities

In the dynamic landscape of the Caspian region's oil and gas industry, AI strategies are being shaped by each country's unique geopolitical and economic scenarios. This region presents a varied picture in terms of AI integration, with Azerbaijan, Kazakhstan, and Turkmenistan showing a similar approach, while Russia and Iran chart distinct paths due to their unique geopolitical circumstances.

Focusing on natural gas production, particularly from significant fields like Shah Deniz, Azerbaijan sees major industry players like SOCAR, BP, and Total leveraging AI to optimize gas extraction and manage rising domestic consumption. This technological adoption reflects a broader trend in integrating AI to enhance efficiency in key sectors—the area, rich in hydrocarbon reserves, benefits from AI instruments to optimize exploration and production activities.

Kazakhstan, a major oil producer alongside Turkmenistan, faces fluctuating global oil prices, prompting AI to play a pivotal role in operational efficiency and cost management. These countries' reliance on oil exports for a significant part of their respective economic development trajectories underscores the potential benefits of AI in managing market demands and production processes.

Russia's approach to AI in the oil and gas sector is more complex. While emphasizing digitalization and the development of fields with hard-to-recover reserves, Russia

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confronts challenges like preference for domestic supply chains and the consequences of the West-led imposition of a sanctions and exports restrictions regime that limits access to global technologies. Despite these constraints, President Vladimir Putin's commitment to developing national AI research indicates a strategic shift for Russia toward self-reliance in technology.

At the Moscow AI conference in November 2023, Putin stated that "monopolistic dominance of such foreign technology in Russia is unacceptable, dangerous, and inadmissible." He pledged to pour additional resources into developing supercomputers and other technologies to help intensify national AI research. With the West's decision to restrict Russian access to its technological solutions, Moscow is turning to allies like Beijing for technology-related assistance, which could boost their local AI development. Putin also emphasized that banning AI development would be impossible but noted the importance of ensuring necessary safeguards.

Russia's interesting approach to the AI revolution will most likely see the development of its own AI tools for the oil and gas industry. The question now is: will Russia's oil and gas industry be able to keep up with the trends, given the West-led sanctions regime?

Iran has ambitious plans for its AI strategy. It aims to become a leader in AI by 2032 and is actively developing a national AI strategy through collaborative efforts across various government agencies. Nature Index ranks Iran thirteenth in the world for AI in terms of research publications from 2015-2019—ranking higher than Brazil, the Netherlands, and Russia.

However, successive waves of sanctions (whether imposed by the West or the UN Security Council) have significantly hindered Iran's access to advanced technologies and international collaboration, impacting its AI development in the oil and gas sector. Iran faces a critical challenge with the decline in oil production from aging fields, necessitating modern enhanced oil recovery techniques and investment in new field development. Various constraints, including sanctions, hinder Iran's technological progress in this sector. Additionally, increasing domestic energy demand, fueled by subsidies and inadequate energy policies, calls for policy reform and a commitment to technological advancements, especially in AI, to improve production and resource management.

The Future of the Regional Landscape

One prediction is that the AI revolution could encourage regions like Iran and Russia to embrace global trends more openly. Recognizing the critical role of the oil and gas industry in their respective economies, these countries understand the importance of not lagging behind in industry advancements, particularly AI, which is predominantly driven by Western innovation. Despite their gradual openness to global trends, Iran and Russia approach this shift with skepticism and aim to adapt independently, without Western

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assistance. This raises questions about their long-term sustainability in embracing these global trends without external—or at least Western—support.

Another prediction—which seems to be more likely to come true—is that the AI revolution is nudging countries like Iran and Russia to engage more with global trends, especially in the oil and gas sector critical to their economies. While adapting to these advancements, predominantly driven by the West, they remain skeptical, aiming to progress independently. This approach could bolster local talent and technology development due to limited Western assistance, potentially intensifying regional rivalry and leading to further geopolitical fragmentation.

The advancement of Azerbaijan, Kazakhstan, and Turkmenistan in the region is certain. Their critical contribution to reducing Western and Turkish dependence on Russian and Iranian oil and their contemporary adoption of AI in the industry solidifies their increasing importance and positions them as emerging significant players on the world stage.

AI has become a pivotal element in various industries, and its evolution is particularly notable in the traditionally conservative oil and gas sector. The Caspian region offers a unique perspective on these developments due to the diversity of its countries and the complex geopolitical dynamics involving Russia and Iran. This leads to a varied approach in the region's oil and gas industry: Azerbaijan, Kazakhstan, and Turkmenistan embrace foreign investment and Western AI trends, while Iran and Russia, driven by the West's choice to impose sanctions, are forging ahead with their own AI and technology strategies. This disparity prompts questions about the impact of Iran and Russia's challenges on their development and the wider global scenario. Their drive and tech capabilities are clear, but they must navigate AI advancement without Western support—a key force in this tech revolution.

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