Chapter 17
Risk Management in the Oil and Gas Industry Related to the AI Tools

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ABSTRACT

The oil and gas industry is in a stage of intense focus on safety, preparing for better management of environmental risks and mitigating them. Given the policy of corporate social responsibility, technical and economic challenges, as well pressures in domain-specific regulations, it has become increasingly obvious that the management of these risks is essential for long-term sustainability of oil and gas companies. Research shows that safety and environmental issues, compliance with regulatory rules, price volatility, and rising challenges associated with access to oil and gas reserves and markets are the top risks identified by oil and gas industry executive directors. In this sense, the tools offered by artificial intelligence can contribute to the proper management of these risks and to the adequate monitoring of all the categories of processes that take place at the level of the optimized production generated by the gas wells, regarding the transport of petroleum products through the pipelines and especially with regard to offshore activities.

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INTRODUCTION

The oil and gas industry remains a vital part of the global economy. The contribution of the oil and gas industry to the overall economic evolution is also highlighted by the fact that the dependence of the European Union (EU) on energy imports, especially on oil and natural gas, is the basis of the policy concerns related to the security of energy supply. In this regard, in 2017, over half (55.1%) of the available raw energy from the EU-28 came from imports. Specifically, Russia was the EU's leading supplier of crude oil, natural gas and coal in 2017. In relation to the oil and gas field, there are already transport networks of these raw materials to countries such as Italy or Spain from Algeria through Tunisia and Morocco. In addition, there are numerous infrastructure projects in the energy sector in different stages of design and implementation: NABUCCO, SOUTH STREAM, NORTH STREAM etc.

The importance of oil to the world economy derives from the simple fact that the current energy model is dominated by oil, and energy is the foundation of all economic development. The oil crises triggered in the 1970s led to strong changes in the world hierarchy and was an aggravating factor of the crisis of the communist system. Recent developments in the oil market are attracting much interest, both from specialists and beyond. Developing countries are the main exporters of fuels, with a growing share, and the developed countries the main importers, with a decreasing weight.

The need to support investments in the oil and gas industry is also due to the increase in real terms of the demand of energy at the level of the big consumers and, in particular, due to the special advance of the transports in the big countries (the case of China and India, which together exceed 2.5 billion inhabitants). Paradoxically, although developing countries are the main exporters of fuel, the effect of rising oil prices on the economy of these countries, as a whole, is a negative and not a positive one. The only region where oil revenues exceed oil payments is the Middle East. The other regions are net importers, and the payments exceed the receipts. In Africa, for example, only 12 countries are net oil exporters, 37 are net importers, and in the latter, 57% of Africa's population lives. Asia, with about 3.5 billion inhabitants, is also a net importing area (with China and India at the top of the list), and in Latin America the situation is similar: only 8 countries export oil, the remaining 25 are importers. Oil crises have had considerable economic, geopolitical, geostrategic, social and cultural consequences over the years. Therefore, any risk associated with the oil and gas industry can create major imbalances in economic, geopolitical and social terms. The knowledge, description and management regarding these risks are mandatory in the current economic, social and political context. Since this equation also involves the technology, within this chapter it will be presented examples of technical solutions offered by the Artificial Intelligence (AI) tools that can significantly reduce or even eliminate the negative impact of manifesting of these risks which are defining the oil and gas industry.

Description of Risks and AI Tools

From the beginning of history, risks have been one of the biggest and most fascinating challenges for humanity due to its ubiquity in all fields of activity (Handmer & James, 2005).

What is the risk? In the acceptance of the classical decision theory, it is identified as an uncertain element, but it may appear permanently in the process of socio-human activities, whose effects can be harmful and irreversible (Holton, 2004), it can also be interpreted as: