

Digital Transformation Use Cases in the Oil and Gas Industry

While the COVID-19 pandemic has caused severe social, economic, and financial disruption across the globe, the oil and gas (O&G) industry seems to have been the hardest hit. The O&G sector suffered twin blows in the form of a severe demand disruption and a significant oversupply in the market.



Amidst the global downturn of events, industries across the entire business spectrum turned to digital technologies to survive the blow, rewrite their operating landscape, and build an agile infrastructure. For the O&G industry, too, the potential benefits of going digital were plenty — cost savings, safer operations, increased productivity, and improved resiliency to weather the unpredictability and remain competitive amidst rising demand for alternative, environmentally-friendly energy sources.

From upstream activities like seismic imaging, advanced geoscience data analysis, complex subsurface formations imaging, asset performance management, and development drilling to the downstream fleet and supply chain management, technologies like artificial intelligence, cloud computing, IoT, and advanced analytics have redefined the entire oil and gas value chain.

Despite these advances, the adoption of digital technology in the oil and gas industry is yet to reach its maximum potential.

According to the EY Oil and Gas Digital Transformation and the Workforce Survey 2020, 58% of the respondents said the COVID-19 pandemic has made investing in digital technology more urgent, with a majority planning to invest a great deal (29%) or a moderate amount (51%) relative to their total budget. Yet, amongst more than 200 oil and gas companies surveyed by PwC, only 7 percent identified themselves as “Digital Champions.”



Let's explore further.

Challenges to Digital Transformation in the Oil and Gas Industry

According to the above mentioned EY survey, two-thirds of the respondents (nearly 66%) consider the inability to change quickly as a major challenge to the adoption of digital technologies in their companies. And, why is that? Oil and gas companies are largely process-driven throughout the value chain. From upstream to downstream activities, operations are designed to bring routine to the working environment. Thus, building a culture of innovation that supports technological disruption is challenging to achieve.

Moreover, capital-intensive businesses like O&G, especially which lack sufficient understanding of business priorities, can't depend on the trial-and-error route or take a multi-technology approach to address a business problem.

Additionally, outdated processes and organizational structures, the absence of a digital operating model, and the lack of a conducive culture that promotes knowledge-sharing and new ways of working are impediments to digital transformation in the oil and gas industry.



Digital Transformation Journeys in the Oil and Gas Industry

Leveraging AI, Big Data, IoT, and Analytics to boost data-driven decision-making

Research by Gartner suggested that oil and gas CIOs listed AI, machine learning (ML), analytics, and industrial IoT as the top game-changing technologies in 2021.

Oil and gas companies, especially large establishments, generate a plethora of data around seismic exploration, micro-seismic data, reservoir characterization, drilling time, average recovery rates, the performance of production pumps, shipping and transportation data, petro-chemical asset management, and much more. A significant amount of this data gets siloed within different geographies, business lines, and single-operating units.



By integrating such diverse data (using cloud technology, data standards, servers, etc.), analyzing and visualizing data (using machine learning, wearables, and big data analytics), O&G companies can increase operational efficiency, identify better areas to drill, improve asset maintenance, decrease unplanned downtime, and optimize production activities. For example, enhance subsurface evaluation to improve the accuracy of pre-drill resource estimates, advance the interpretation of seismic data and reservoir models, and increase resource recovery in production.

Modernizing core asset management with IoT sensors

Given the asset-intensive nature of IoT, oil and gas companies must modernize their core assets, including storage tanks, pipelines, wellheads, rigs, facilities, and platforms.

Intelligent asset management calls for connecting vital equipment and field assets with smart sensors and data transmitters to the IoT platform. AI chatbots can generate real-time alerts and insights into operations and processes to respond to field conditions, monitor field operations remotely, and optimize production efficiency, uptime, equipment utilization, and maintenance planning.



Moreover, the development of digital twins can improve the performance of O&G assets and deliver business value. A digital twin serves as the real-time digital counterpart of a physical object or process. They help players in the O&G industry integrate internal systems, external ecosystems, and human activity and reduce asset maintenance and maintenance costs.



Rockwell partnered with Microsoft's IoT services to increase productivity and reliability in O&G operations. By using sensors connected to the cloud, Rockwell can monitor pumps' variable speed motors from its command center in Cleveland, Ohio, to identify and immediately deal with issues, thus, saving up to \$300,000 of production per day that a malfunctioning pump at an offshore platform can potentially cost the company.

Mitigating occupational hazards with intelligent health, safety, security, and environmental (HSSE) applications and a more connected workforce

Combining AI, ML, Big Data analytics, augmented reality, machine vision, and IoT platforms (wearables and smart wearable equipment), O&G companies can monitor potentially fatal on-field signs, such as hazardous gas levels and unauthorized personnel entry.

Consequently, AI chatbots can issue real-time alerts in case of potentially threatening and unsafe conditions and health or lockout emergencies, send automated permits to work on-field right at the employees' fingertips, and drive reliability and efficiency by creating a landscape of more connected field workers. IoT and AI can drive operational efficiency by proactively detecting, troubleshooting, and resolving issues, so a technician is dispatched on-site only when needed.

Developing a connected supply chain with intelligent enterprise resource planning (ERP) applications

By integrating AI and machine learning, intelligent track-and-trace technologies, cloud-based platforms, and Big Data analytics with ERP applications, O&G companies can augment and enhance supplier interactions, logistics, and warehousing, with smart replenishment, shipment transparency, and digital category management.

Moreover, intelligent IoT devices can monitor and transmit vehicle data in delivery fleets, including vehicle performance, fuel inventory, and fuel consumption. Such analysis can be used to schedule vehicle maintenance on time and prevent equipment failure.

For example, Rockwell leveraged Microsoft's powerful technologies to automate the measurement of LACT (Lease Automatic Custody Transfer) units – namely, “skids.” LACT units estimate the amount of product transferred from one container to another as it moves downstream. It is typically a siloed and manual task done with only paper records, making it susceptible to inaccuracy and errors.

Now that we are aware of the various use cases of modern technologies in the oil and gas industry, let's deep dive into how O&G giants British Petroleum (BP) and Shell leveraged Microsoft technologies to launch major digital transformations in their business operations.

British Petroleum (BP) uses Microsoft Azure AI to increase employee safety, boost efficiency, and drive operational success.

British Petroleum (BP) has embraced Microsoft Azure AI and Azure Machine Learning to transform its oil and gas operations.

Diana Kennedy, Vice President, Strategy, Architecture, and Planning for Information Technology and Services at BP, stated, “A key part of our transformation has been to embrace the cloud and the digital solutions and services that come with it. This includes a deep dive into AI and machine learning, which we're using to reengineer our processes both on field and in the office to be safer, more efficient, and more organized.” BP has developed an intelligent operations concept that takes the company's vast plethora of data and the tremendous experience of its engineers and codifies them into AI solutions that promote predictive maintenance.



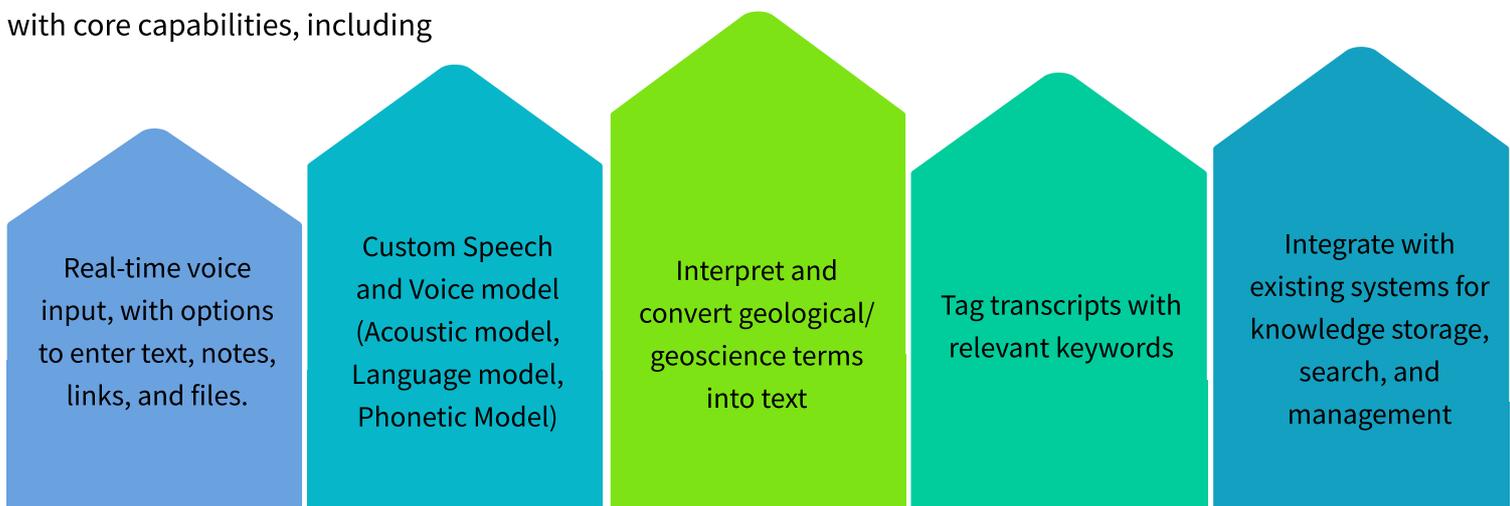
BP is partnering with Microsoft to create autonomous platforms where employees can more safely manage day-to-day operations remotely using AI. Using machine learning, BP looks to improve decision-making about scheduling transport ships to drive efficiency and reduce energy consumption.

Another one of BP's exploits with Microsoft AI solutions is a project that capitalizes automated machine learning to forecast the recovery factor of potential oil and gas reservoirs, i.e., the percentage of hydrocarbons that they can extract from an underground deposit — a process that typically requires analyzing a database containing nearly 200 different properties of a reservoir—rock, flow, geological, and geographic properties, and comparing them to known data from previous projects.

Shell uses a virtual knowledge capture assistant to help geoscientists preserve tacit knowledge

Geoscientists gather a plethora of valuable oil and gas exploration and drilling knowledge, and interpret and convert this data to meaningful, actionable insights. However, capturing and storing this data is a tedious, time-consuming manual task, highly dependent on human parameters. Such data should be easily discoverable for the benefit of newer personnel joining the organization, and shouldn't be lost if existing geoscientists leave.

Leveraging Microsoft's renowned conversational AI, speech, and natural language technologies, we at Acuvate, developed a virtual knowledge capture assistant that can capture substantial knowledge from geoscientists, with core capabilities, including



How can Acuvate help?

Acuvate Software is a global player in next-generation digital services and consulting with 15+ years of experience breaking down data silos and improving operational and cost efficiencies for numerous oil and gas industry players worldwide.

We leverage new-age technologies like cloud computing, AI, Big Data Analytics, and IoT to build enterprise apps and platforms that support intelligent analysis and collaboration and redefine information orchestration and operations in the oil and gas industry.

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