LTIMindtree

Digital Transformation of Rig Operations - **The Four-Fold Path**

Introduction

The Oil and Gas industry is often faced with multiple challenges such as crude price volatility, geopolitical headwinds, and pressure on de-carbonization. The pandemic situation that the world has been witnessing since early-2020 led to dual shocks on both demand and supply and the upstream sector was the first to take the hit. It has thus become prudent to have optimum efficiency in operations, with a minimum risk of failures and resultant revenue losses.

Digital transformation holds the key to realizing an asset's true value, particularly now more than ever before.

This document aims to bring the focus of the rig operators towards four key pillars, which, when addressed with the finest approach, can lead to huge savings and increased productivity.

Typical Challenges in Rig Operations

Challenges in a Drilling Environment

Lack of digital mobility solutions for efficient execution

Issues in inventory and logistics management

Unavailability of remote sensing options at business-critical areas

Inefficient emissions management

Unavailability of Integrated decision-making platform for rig managers

Lack of solutions to facilitate virtual visits and support to rigs
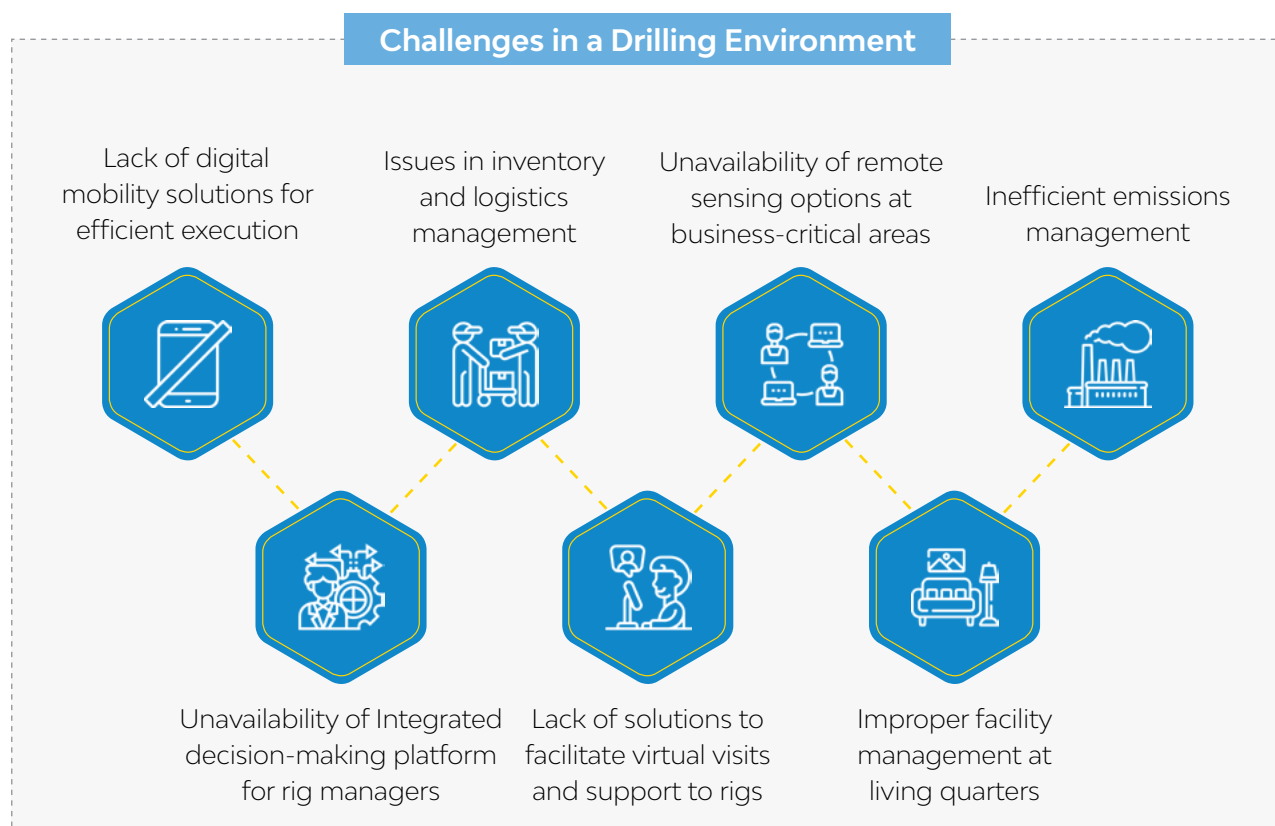
Improper facility management at living quarters

Fig: Typical challenges in a drilling environment

An offshore rig environment has all the typical challenges of any Oil and Gas asset, such as dealing with harsh work conditions. There is also the expensive and time-consuming task of getting technical assistance from shore. Dealing with a highly corrosive environment, traditional, low-bandwidth connectivity, and higher safety risks compared to land are additional issues a rig operator has to deal with.

For companies with rigs in multiple geographies, the lack of a centralized data view hinders cumulative decision-making and strategic planning. Even though rigs function as an overall ecosystem, the components appear to be operating in their own silos. So, the operator cannot reap the benefits of an integrated rig landscape. Dependence on manual operations further adds to the difficulty of data management and results in the loss of productive time.

Four Digital Levers to streamline operations

A planned investment and effective execution on the following components can lead to returns in a short period:
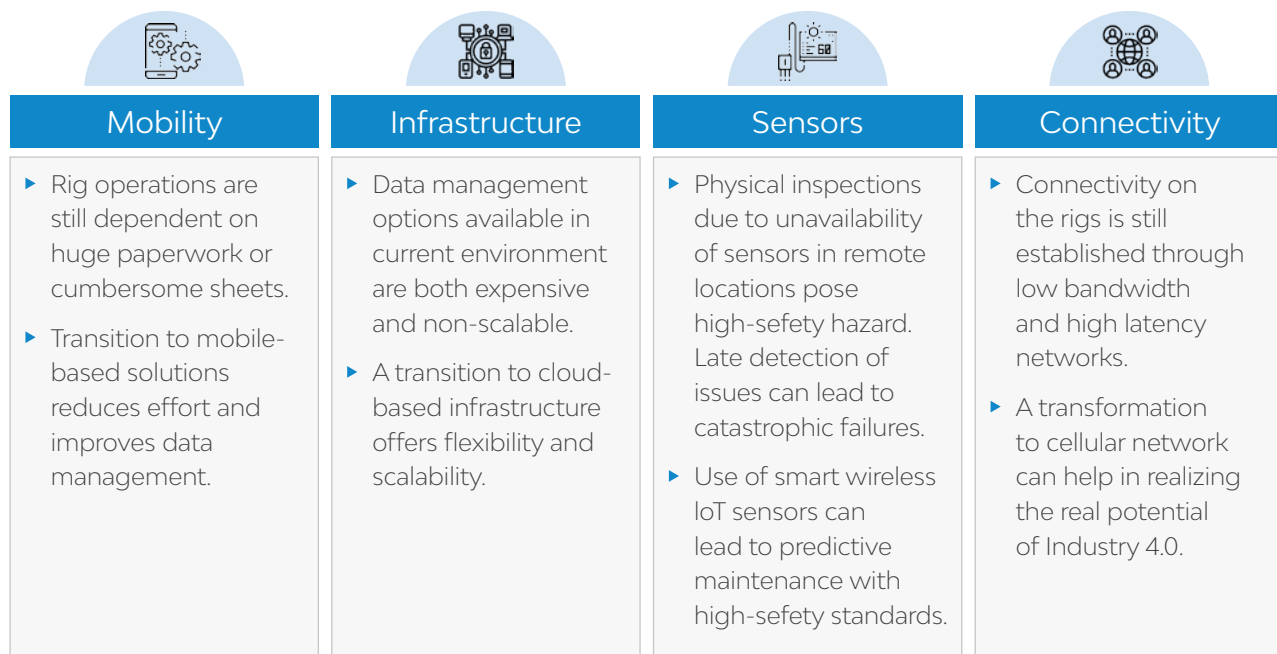
Mobility	Infrastructure	Sensors	Connectivity
▸ Rig operations are still dependent on huge paperwork or cumbersome sheets. ▸ Transition to mobile-based solutions reduces effort and improves data management.	▸ Data management options available in current environment are both expensive and non-scalable. ▸ A transition to cloud-based infrastructure offers flexibility and scalability.	▸ Physical inspections due to unavailability of sensors in remote locations pose high-sefety hazard. Late detection of issues can lead to catastrophic failures. ▸ Use of smart wireless IoT sensors can lead to predictive maintenance with high-sefety standards.	▸ Connectivity on the rigs is still established through low bandwidth and high latency networks. ▸ A transformation to cellular network can help in realizing the real potential of Industry 4.0.

Fig: Digital Transformation Levers

a) **Connectivity:** Offshore platforms are disparate assets with traditional communication techniques that are limited or expensive. According to McKinsey, high-band connectivity like 4G/5G can generate a three percent improvement in production. By deploying digital tools over cellular connectivity, over 20% of cost savings can be realized. Just one cellular antenna can serve the network requirements of an entire Oil and Gas rig[1].

b) **Smart Sensors:** Due to the inaccessibility and isolation of rigs, getting an up-to-date, accurate picture of the production and potential failures is a challenging task. Remote Monitoring using smart Internet of Things (IoT) sensors helps detect failures in advance and trigger preventive inspection. These sensors can use low-power technologies such as NarrowBand-Internet of Things (NB-IoT) and Category M1, or Cat M1 wireless (sometimes also abbreviated LTE-M) to communicate over and leverage the on-board cellular network. With the advancement in technologies, these sensors are available at competitive price points, and the Oil and Gas assets can realize significant annual maintenance cost savings through their implementation and deployment.

c) **Infrastructure:** Information management is the most important and complex element for the Oil and Gas industry, particularly with the massive data flow and the rapid growth of sensors and connected devices. The emergence of cloud service providers has allowed oil and gas players to focus on their core competencies while leaving IT systems management to technology players.

d) **Mobility and Applications:** In the Oil and Gas industry, it is critical to ensure optimum utilization of available resources. Mobility can help reduce the cycle time required for performing routine operations in the upstream oil and gas industry. The acceptance of mobile technology is constantly increasing since the sector demands its workforce to be mobile, along with good connectivity, and collaboration with the centralized team.

Some of the critical use cases which can leverage the digital levers for optimum value realization

a) **Early corrosion detection and failure avoidance using non-intrusive CUI (Corrosion Under Insulation) sensors**

Corrosion in pipelines and structures can lead to catastrophic failures, but direct inspection or monitoring is neither simple nor inexpensive.

With the advancement of technology, however, smart non-intrusive solutions are available, which can leverage the 4G connectivity and transmit the required parameter.

Fig: LTE-M enabled corrosion monitor

The NB-IoT enabled Corrosion Under Insulation (CUI) sensor detects and locates corrosion and moisture in the most inhospitable and inaccessible locations using a distributed sensing technology. Sensor data is further used in an advanced analytics platform, which can also be integrated into the existing asset management system that, in turn, provides actionable insights for proactive and preventive maintenance.

b) **Digital inspections and maintenance job execution using a mobility-based solution**

Visual inspection is the most common technique used in Oil and Gas industry to identify corrosion, pitting, cuts, fatigue cracks on the rigs, drill pipes, and tubular equipment. Daily field visits, followed by documentation and updating the rig managers, are the norm. Most rigs are still dependent on paper-based notes, followed by updates on a desktop application.
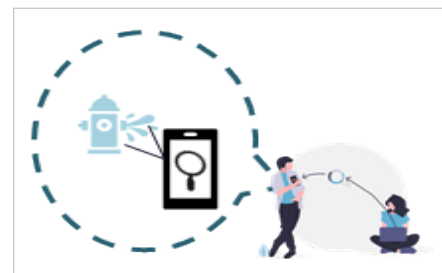
Replacing this cumbersome process with a mobile application that can receive work orders from MES systems and enable digital inspection of offshore equipment can result in huge efficiencies and savings in FTE cost for inspections.

c) **Interactive decision dashboard to assist rig managers with efficient planning and forecasting**

Rig managers monitor rig operations, coordinate drilling activities, implement safety measures, train staff, and supervise material movement. Regular data updates from multiple sources and subsequent calculations and parameter optimization are required to perform these tasks effectively. Currently, most rigs face the challenge of non-availability of timely data, limited information, and delayed alerts. Also, there is limited direct communication with the core rig workers.

An interactive decision dashboard can take input from multiple source systems and enable managers to get all the necessary updates and alerts in real-time to avoid any human error and confusion. With this information, rig managers can make informed decisions for efficient planning, substantially improving monthly productivity.

Conclusion

A transition towards digital transformation can help rig operators realize the true value of their assets and pave the path towards sustainability. With increasing regulatory pressures and price volatility, deployment of innovative Industry 4.0 solutions over a low-latency network can help the rigs save millions through reduced commute, manual efforts, and remote decision making.

However, the requirements across the industry may vary based on the maturity levels, user adoption of technologies, age of the asset, and many other factors. Customers should get an assessment done to understand which lever can be best addressed to reap maximum benefits.

Reference

1. www.mckinsey.com/industries/oil-and-gas/our-insights/how-tapping-connectivity-in-oil-and-gas-can-fuel-higher-performance

About the Authors

Nishant Chaplot
Associate Director – Projects, LTIMindtree

Nishant brings 18+ years of experience in the IT industry with 10 years in the Oil and Gas Industry, managing upstream IT application portfolios for Oil and Gas customers. He has experience in Delivery Excellence, Customer Relationship Management, Strategic Planning, People Management, Change Management, Forecasting, Budgeting and Vendor Management.

Vinod Khatri
Associate Director – Projects, LTIMindtree

Vinod is a Certified Project Management Professional with 15 years of experience in Oil and Gas, Process and Manufacturing Industries across different geographies. He has worked with Oil and Gas customers performing roles of Asset Information Management Consultant, Project Manager and Business Analyst. He has combined domain and IT experience on Engineering systems and is successfully leading diverse technology projects.

Shubham Shrivastava
Senior Specialist – Consulting Practice, LTIMindtree

Shubham is a result-oriented and analytical strategy consulting professional with over 10+ years of industry experience in the fields of Digital Transformation, Asset Management, Process Automation Reliability, Cyber Security, IIoT and Project Management. He has experience in the EPC industry assisting Business leaders in Market intelligence, Business development strategies, and Cash Flow management.

Vivek Patel
Senior Consultant, Consulting Practice, LTIMindtree

Vivek is an experienced and result-oriented O&G domain consultant and has contributed to several projects in the fields of G&G data digitization, ETRM application integration, emissions monitoring in Offshore O&G platforms, Reliability and Maintenance, Connected rig-as-a-service, and Digital maturity assessment. He has hands on experience in subsurface data management and business reporting tools.