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# How To Master Upstream Data Management: A Guide to Operational Excellence

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Friday, Feb 19, 2016  
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# 01 Introduction

The Oil and gas (O&G) industry is a data-driven industry where terabytes of data are generated and used in multiple phases of Exploration & Production (E&P). In recent times there is an industry-wide initiative to leverage digital solutions and effective data management practices to increase the accuracy of interpretation, shorten the interpretation cycle time and optimize drilling operations. Efficient data management practices and easy access to trusted datasets are one of the key driving factors to faster analysis and decision-making.

To achieve these intended objectives, an efficient data management practice should be built in sync with Operational Excellence (OE). The main challenges faced by geoscientists today include extensive data silos due to complex and non-standard formats of data storage. Secondly integrating legacy datasets often in paper formats with workstation-ready current datasets for integrated interpretation is a time-intensive manual process. Thirdly, the absence of a standard-based single platform to access all types of data has created multiple copies of the same dataset. To overcome these challenges the role of quality data management is very important. The main steps involved in creating a unified data store include data analysis across applications, format conversion, metadata capture, maintaining data quality and lineage, creation of trusted datasets, data loading in target platforms and in some cases ingesting the data in cloud native platforms like OSDU™ data platform.

Data management practices exist in every E&P company, but the data quality often suffers a lot due to multiple reasons primarily a lack of data governance. So, the best practices for data management have to be defined with an analytical approach, keeping in focus data quality, metadata attributes, and lineage. The main objective is to create a trusted golden dataset and easy accessibility to these golden data which help in better and more valuable interpretation to make the correct decision at the correct point of time by the E&P companies. In recent times due to frequent oil price changes, every oil and gas company is looking for a steady solution to reduce costs, that can lead to profitability. As a result, the companies are trying to adopt Operational Excellence in each business process including data management.



# 02 Key principles of Operational Excellence

Operational Excellence is believed to be a philosophy that is focused on customer requirements and accepting the changes instantly in the process/priority based on the customer's interest, following continuous improvement methods. Operational Excellence should be an integral part of any business process and should not be treated as an add-on that can be adopted as and when required. An organization is adopting OE intending to grow their business with maximum profitability and productivity. While all these target the internal processes the focus should be "Help Customer." Below are a few reasons why some business process needs to use OE.



## Reduce cost to increase revenue

To maintain a competitive edge as well as to address new challenges every organization needs to have a completely different view on OE. Cost is a crucial component to staying strong in the competitive environment of any organization. Optimizing the project cost with the key business metrics helps to stabilize the business. Most of the companies adopting OE in their business process will benefit from its data-driven approach to analyzing and evaluating the situation. These well-defined steps at every stage of the business process help in lowering the costs and increasing the revenue.



## Maximum productivity with quality

Delivering quality data in a stipulated time is an important key to a successful project. A project can deliver quality work if every stage of the project is very clear and well-defined. The objective of the work should be analyzed critically and the process to achieve that should be standardized and should be in alignment with the policies and procedures of the company to maximize efficiency.

The workforce must keep the process very simple and organized so that the problem can be identified easily, this will help the organization to maximize productivity and deliver high-quality products to the customers.

Once the workflow is defined it should be strictly followed unless or until some unique problem arises. Unnecessary steps and variation lead to extra time and cost. In addition, in doing so, there are chances of more mistakes. Operational Excellence helps reduce unwanted steps in the business process that affects overall productivity.



## Higher customer satisfaction

Operational Excellence is the core of success in improving customer experience. The heart of Operational Excellence is creating value for the customer which is mostly related to collaboration. The advantages of OE principles are that it focuses on improving customer satisfaction and for that, it is important to emphasize collaboration with a wide process orientation along with respect for people. The focus should be on a management strategy that strives for consistent and reliable results in meeting and exceeding customer expectations.

In the O&G data management project customers' expectations and demands change from time to time. So, responding to those changes as and when required increases customer satisfaction. It is important to understand each requirement of customers and continue to work on those changes to achieve the goal.

Customers often need to analyze the gathered data from different stakeholders which is present as silos for quick and faster decisions. As the data are present in silos brings a complex data structure that requires a great level of attention to ensure compliance. Implementation of Operational Excellence helps reduce the error and increase customer satisfaction by maintaining defined workflows and quality.



## Effective communication with stakeholders

A project always deals with multiple stakeholders. Though different stakeholders perform different roles, they are working towards a common goal, which is achievable through effective communication. Through good communication, it is possible to get an idea about their objectives and goal and accordingly the business plan can be reviewed to identify opportunities for growth and development as it highlights areas for improvement and focus. Every team member should understand the business relationship with other departments and stakeholders. Effective communication reduces conflicts and misunderstandings between different stakeholders and increases understanding of project requirements.



## Future-ready resilient and adaptable business

Presently we are passing through a technology-driven era, where if any organization wants to be successful future-ready technology is the main key aspect. An organization that is using the best and appropriate technology for any project always improves things at a better pace. The improvement in the technology used throughout the business (workflow, different stages, reporting, operations) will enhance Operational Excellence, which ensures that the business is resilient and adaptable. When the industry passes through any kind of stress, it revealed the actual readiness for the changes. In other words, it reflects the adaptability, the robustness of internal capabilities, and the eagerness to find out new sources for growth.

When the situation around the world seems to be uncertain, it becomes more important for every organization to be future-ready. Every business must adapt quickly to changing social attitudes and customer behaviors along with the adoption of sustainable practices.



## Continuous improvement in performance

OE creates value through systematic and repeatable actions for every stakeholder in the organization. Though it is based on well-documented standard processes created over time required continuous improvement in operating performance. Every project and business has a goal to improve the workflow and provide more value to consumers with efficiencies and avoiding waste. OE can be achieved only with continuous improvement of business, processes, and the way of working. Every organization assimilates to achieve consistency, growth, and sustainability by adapting a long-term model of sustainable changes in organizational culture. The path toward OE goes through innovation and continuous improvement and there is no shortcut to that.



## Efficient workforce and collaborative leadership

Progress and development can achieve OE if it is driven by an efficient and skilled workforce along with a committed leadership team. The project value can be maximized when the workforce works together for a common goal by achieving specific and realistic deliverables.

Some ways to involve all the employees in pursuit of Operational Excellence is to communicate with a proper vision of the project, provide them appropriate training, motivate employees with rewards, and give ownership of their roles. The workforce should be well engaged within a company, the team should work in synergy to gain from each other's strengths. Each one in the project should be well informed about the task and the best workflow to deliver that keeping other members in the loop.

Along with the skilled workforce involvement of leadership is also a key factor in OE. A leadership team needs to drive the end-to-end strategy and keep the team motivated, focused, and encouraged to deliver good results. Leadership can help to break the silos and make a unified team that can build an end-to-end maturity-based process with the help of the right technologies to achieve Operational Excellence. Significant involvement of senior leaders in terms of time and effort to clear the doubts of common employees will surely reflect in workforce performance and obviously in organizational culture. Process improvement is always a top-down approach starting from leaders to achieve OE.

# 03 Adoption of Operational Excellence in upstream O&G data management

Operational Excellence is required in each business and every client requirement is to follow the process which will be quicker, cost and time efficient. Following the standard workflows and best practices helps in achieving Operational Excellence.

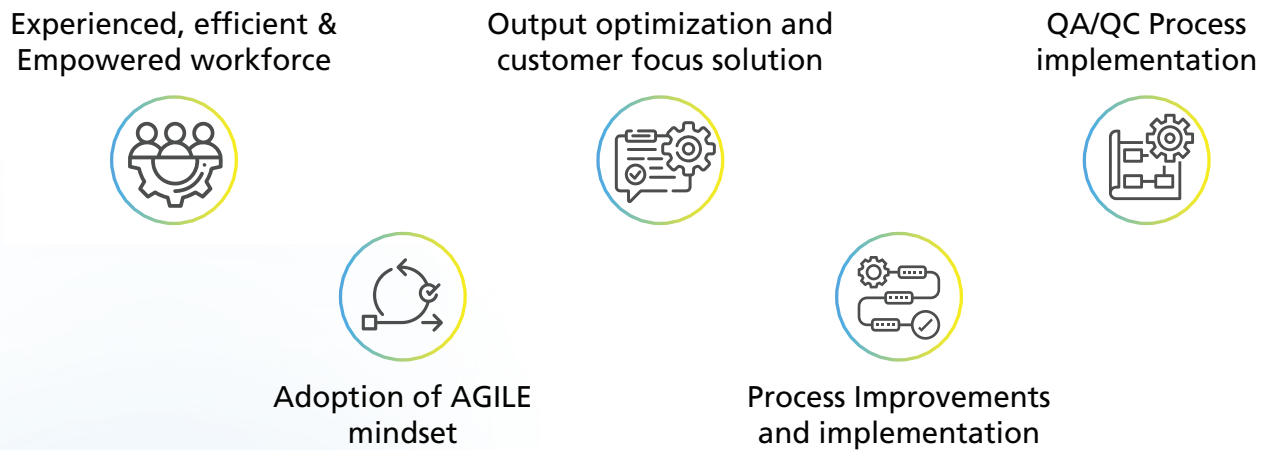


Figure 1: Different elements to achieve Operational Excellence

### 3.1 Experienced resources and high-performance workforce:

Team with a vast experience in Upstream Oil & Gas and technology is capable of handling different geoscientific data and applications, which eventually helps the entire team to provide a better and quicker solution. The categorization of data type is at their fingertips. They can easily anticipate the variety of problems being encountered. Experience in the core field helps in assessing and understanding the problems in a better way. If a team member is unaware of any process and data type, then the other can help to pick up the speed. This will lay the foundation for a cohesive team. In addition, a consistent training program and following best practices to keep team harmony will help to achieve the goal.

### **3.2 QA/QC process implementation:**

Operational Excellence ensures the delivery of quality products and services. QA/QC is followed at each step of the data management process to mitigate errors while providing a better solution. QA/QC process performed by experienced SMEs (Geologist, Geophysicist, Petroleum Engineers) who easily understand upstream data and help to meet the client requirements as per their expectations. Domain & technical knowledge helps in the migration of data from one application to other and addressing the issues. People from different background work in collaboration to analyze the data and evolve qualitative solutions in reduced time and effort.

### **3.3 Process improvements and implementation:**

Process improvements like using scripts and implementing automation tools to meet the client demands help in the reduction of time as well as saving cost. With time, enhancing the workflows is mandatory to sustain in any field. Empowering resources with goal-based training from time to time as per industry helps in providing better solutions easily. Development of applications/tools using SQL, Power BI or Python helps to reduce cost and time rather than going for outsourcing. Preparing Power BI reports to meet the daily needs in upstream data management helps in quick and easy solutions. Designing and knowledge of workflows in G&G applications make the jobs easier in the data management process.

### **3.4 Output optimization and customer focus solution:**

The entire objective of OE is to provide a rich set of information and data management capabilities that will provide quality data in a timely manner from any source and present in a way that maximizes the value of that data for both internal and external stakeholders. With the help of improved technology and an experienced team, it is easy to understand the requirement and deliver quality data in a shorter interval. The upstream data is very expensive and sensitive so it is very much required that the customer requirement is clear to every team member so that they can deliver the output without error and in a defined time. Following Standard Operating Procedures and implementing best practices helps to arrive at the best and quick solutions.

### **3.5 Adopting an agile mindset:**

Using an agile mindset to deliver work through cross-functional interdisciplinary teams that build functional data products across a portfolio of value stream efforts. This can be achieved by mentoring the groups on Business Agility & Delivery Agility.



# 04 Challenges in implementing Operational Excellence

Operational Excellence has a positive impact on the organization, as it is a highly reliable and continuously improved process-driven approach. Understanding customer and market needs can create a value system within an organization to outperform in competition.

In the practical situation, there is a constant change in customer requirements, so the business needs to modify policies and procedures every time so that the output is delivered with quality and on time. Thus, there is constant pressure to achieve OE without failure. In this paper, we will discuss the challenges faced by the service trying to achieve excellence.

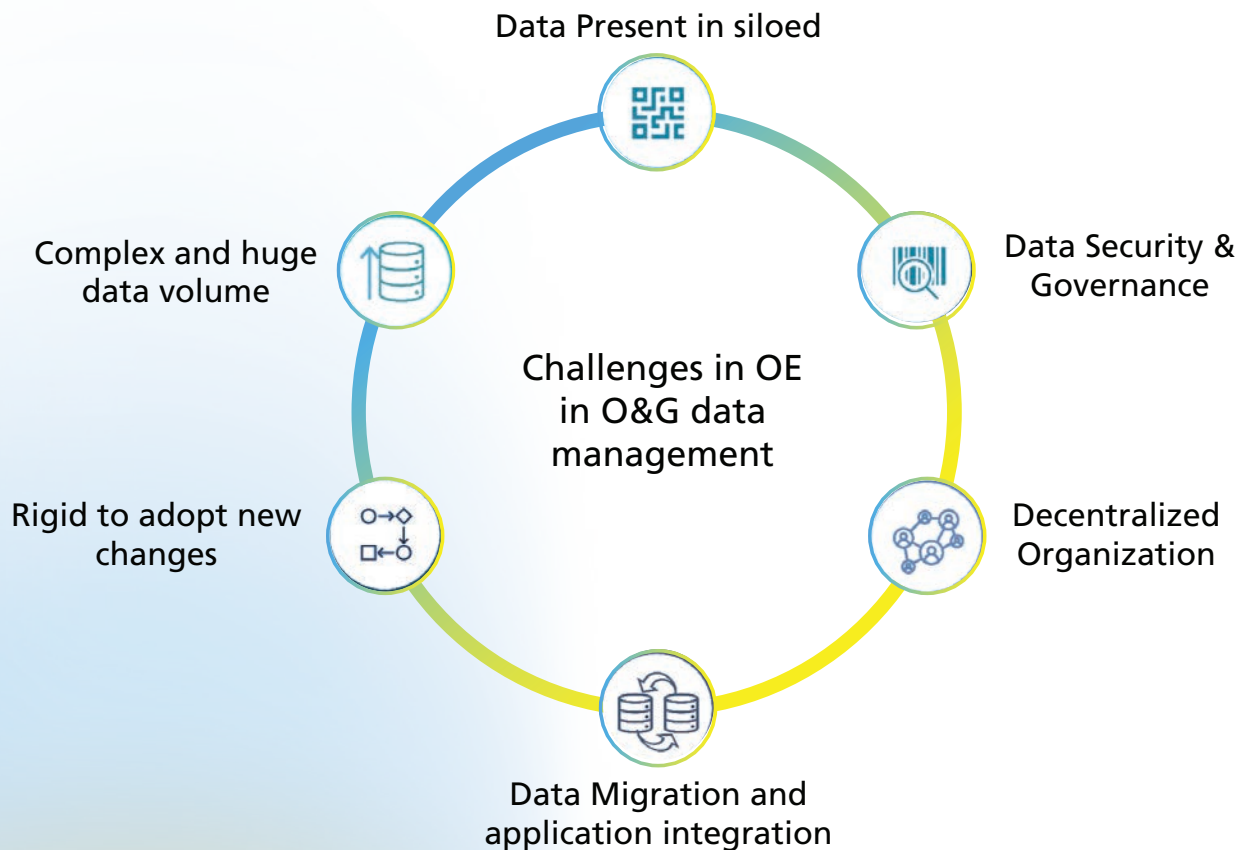


Figure 2: Challenges in achieving Operational Excellence

## • Complex and huge data volume

The O&G industry is having a huge data set generating from every newly invented Geophones to the most recent logging sensors. In terms of data, this industry is the wealthiest one. 100's of TB data is generated for every single well and to access this data in the quickest time possible, quality is getting compromised. Moreover, the type of data in the upstream field is enormous. With the advancement of technology, the type, quality, and quantity of data are increasing day by day. Data categorization is a huge challenge as the data type is changing now and then. In addition, for every O&G practitioner, it is not possible to know each data type. Like for a geoscientist it may not be possible to know the data of a production engineer and vice versa.

## • Siloed Data Source & Data Consolidation

From the beginning of exploration up to the production of a well lifecycle, many departments are involved and generate various types of data in huge volumes. All these data are kept with different stakeholders in different storage or repositories. Siloed data present in a standalone system are many a time incompatible with each other. This can restrict the use of the data in different parts of the organization which needs proper data management. But it got so many challenges, as the data is costly and compliant, so accessibility permission is required at every point in time.

Often this process of gathering and analyzing data from different stakeholders consumes more time and has chances of more errors. To understand the overall picture and data insight, a consolidated system is required to collect, clean, correlate, and format from siloed sources. After data cleaning and formatting a storage or repository is required to keep all the data together, where the stakeholders can easily access different data at a time in a single platform.

## • Data Security and Governance

Data is the most valuable, sensitive, and strategic asset of any organization; hence the most critical challenge is to protect the data from loss, misuse, and mishandling. As upstream O&G data is huge in volume and more than 70% of data collected is in unstructured form and available in multiple storages with multiple stakeholders, it is a significant challenge to protect the data during migration, cloud adaptation, and other data handling processes. Also, to remember that data, by its very nature, changes forms and criticality levels, from generation to disposal, with multiple internal and external stakeholders requiring access.

Safeguarding the data by applying an active cyber defense resiliency approach, identity and access management system, encryption management, application security, advanced threat, and vulnerability management, and cloud threat defense system is necessary to avoid data vulnerability and data breaches. A data governance framework in the organization which is compliant with government policy and norms to be implemented for data-related processes.

During the implementation of OE new challenges and risks become more prominent for the organization, so data governance is to be prioritized to handle forthcoming challenges.

## • Decentralized Organizations

Organizations having local/BU level controls have little global visibility into data. This not only leads to non-standard applications and process workflows across the organization but also limits business agility & ambiguous decision-making. Organizations should think about Centralized teams for better control and enforcement of data standards. Adopting a value chain mindset will open access to integrated data driving clear decision-making.

## • Data Migration and Application Integration

The biggest challenge any data management team faces is migrating the Upstream data from one application to another application(s) due to the multi-vendor application integration issues. High skilled technical team is needed to build data connectors for data sync.

## • Change averse mindset

The business is always skeptical while investing in a new approach or technology. Legacy applications, tools, and knowledge confuse the decisions between enhancement and replacement. Technology remains a tool to achieve Operational Excellence. The right approach can bring the business fresh perspectives on technology integration and adoption. Resistance to change and lack of management support is one of the critical barriers.

For continuous improvement, there should be a standard set and to achieve excellence the work improvements should be unhindered. If the progress gets stuck to a particular point, then the whole objective of OE will not be fulfilled. To achieve clear-cut progress incorporation of cross-functional teams is required with a common inspiring vision and smart goals.

# 05 Conclusion

Operational Excellence is a continuous and iterative approach to achieving a common goal. Every individual in the business should understand the business outcomes, give their best efforts, and should help others to succeed. By focusing on continuous improvement as the requirement changes and learning lessons from past events the efficiency of the business can be increased incrementally. To achieve the goal of OE in upstream data management it is highly recommended that every individual involved in the work should follow best practices.

Achieving OE for any organization is a long and tedious process as it requires a lot of experimentation and incorporation of the lessons learned. But it is worth paying as the company that can achieve OE gives the best outcomes and leave all its competitor behind.

In the case of the E&P industry, upstream data is very expensive and precious, so the data must handle carefully by adopting operation excellence to build a future-ready business with maximum cost benefits. To achieve a sustainable solution, data silos must be removed by generating trusted golden data which pass through all the industry standard quality check and storing the data in an easily reachable cloud platform like OSDU. The upstream data can be collected in the same format in OSDU and provide a well-defined set of application programming interfaces that make the E&P company readily access relevant subsurface data.

LTIMindtree has a highly professional team of geoscientists and data engineers who have a vast knowledge of upstream data and are experienced in handling the data with excellence. The company has well-established practices for upstream data management which can be implemented successfully to achieve Operational Excellence in any O&G data management project.



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## 07 Author's Profile



**Mousumi Sen**

Mousumi Sen is a geoscientist having an overall experience of 16+ years in the upstream oil and gas industry. Mousumi brings with her 13 years of domain experience as a seismic interpreter for a producing block on the east coast of India. She has worked extensively in exploration and development projects for well & seismic data interpretation, data analysis, prospect maturation, prospect risking & ranking, location finalization, and location release. She is currently working as an upstream oil & gas Senior Consultant having expertise in subsurface data management, data migration, and workflow integration. She has rich working experience in various G&G applications.



**Soumen Sarkar**

Soumen has overall 13+ years of experience in the upstream Oil & Gas industry and Upstream IT solutions implementation. He has worked as a techno-domain professional for data management, quality check, geo-referencing, data governance, data archival and restoring documents, data migration, and repository management. He also worked with various clients in data management as well as data digitization projects as a domain SME. He is highly skilled in various Petro-technical software.



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Sakunthala Chada is a geoscientist having an overall 16+ years of industrial experience in the upstream oil and gas domain. In her career, she has worked extensively in different exploration projects which include both onshore and offshore. She has experience in Seismic data interpretation, prospect risking, ranking, maturation, post-drill analysis, well data integration, real-time data analysis, and subsurface data management. She has expertise in many G & G applications.

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