

# Smart Operations

By Spencer Roberts and Ian Moore



## Overview

Over the last 2 – 3 years all things ‘Smart’ or ‘Digital’ Oil Field have become the E&P Industry’s new ‘Hot Topic’. Most major operators have programmes that focus on ‘Smart Operations’ (SOP’s). Whether they are called iFields, eFields, Field of the Future or Smart Fields™, these various initiatives have similar concepts and similar goals. Most are aimed at the utilisation of technology to support processes in order to drive production, improve recovery, reduce cost and increase work processes and productivity. However, SOP’s is not just about technology, it’s about capability and collaboration between disciplines, across business units, with suppliers and locations. Figure 1 illustrates a vision of what Smart Operations could look like to an organisation. Why is there such an emphasis on SOP’s? Well there are a number of drivers that are often quoted including:

- Improved production and recovery
- Strong driver in the oil industry to select e-Field solutions

- Competitive advantage
- Better well positioning
- Manpower flexibility
- Ability to leverage cross field / area / asset experts
- Improved utilisation of expertise – internal and external vendors
- Lower cost operation
- Quicker and better decisions at lower risk

All of these, whether separately or in combination, are valid reasons for establishing a SOP’s initiative. However, unless some basic foundation criteria can be addressed, then the investment in terms of time, money and people will be extremely difficult to justify (as some of the players already dabbling in this arena have discovered).

## The Challenge

Whatever the reason for beginning the journey, companies that have started to develop and implement SOP’s solutions are facing a variety of challenges. Organisations are at different stages of the adoption curve, and even the most advanced are the

first to admit that they are only now just scratching the surface of the potential benefits that Smart Operations can bring. There are four keystone themes that need to be addressed to ensure that any SOP’s programme has a chance to succeed; (1) Technology, (2) People (3) Process and (4) Implementation.

## Technology

The technology investments for Smart Operations are not inconsiderable and they are usually based on a business case that demonstrates increased production, reduction in costs, improved profits, better integration, increased quality and/or better risk management. There are two components to the technology side of SOP’s, (1) data and (2) infrastructure/applications.

## Data

Underpinning SOP’s is the availability of data either in Real-Time (live or near live monitoring and collection) or Right Time (monitored and collected at appropriate intervals e.g.



Figure 1: A Vision of Smart Operations

every minute, hour, day multiple days etc.)

Managing the increasing volume of data is critical to the success of Smart Operations. Typically a large offshore field had 1000 input/output data points and produced a 10GBs per day data stream. When this is compared to a typical refinery with 30k input/output data points and 1 Tb's per day data stream it seems moderate in comparison. However, Real-Time Data (RTD) demands new systems for collecting data such as OCIs Pi-System which can collect up to 80k data points on a sub second level or BP's 'Life of Field Seismic' arrays which produce 7 Tb's of data per survey (currently a quarterly occurrence but with expectations of an increasing frequency), then the situation changes.

The huge volumes of data now threaten to undermine the efficacy of the data management process and companies are faced with the challenge of distinguishing between what is mission critical versus 'nice to have'? Data assurance and storage are high priorities, along with global data standards, particularly drilling (WITSML) and data exchange (OPC) formats. The value of data along with an increased awareness of susceptibility to external interference also ensures that security is at the top of many companies' agendas. All of these issues have to be managed in a coherent and transparent manner. Smart alarms with parameter definition envelopes are currently using algorithms to interrogate and automatically monitor data streams and the use of artificial intelligence and agent based analysis may very soon become commonplace.

The ability to access data and documents to interact with real-time data also has to be considered. In a recent example remote integrity monitoring of a pump detected a potential issue on a Friday evening. However, the operators could not find the relevant engineering specifications to be able to manage the problem.

The pump vendors and their agents were uncontactable over the weekend and the pump was left running until it failed on the Sunday! Having a document management system with the appropriate searching capabilities is essential to leverage the full potential of Smart Operations

### Infrastructure/Applications

The majority of technology infrastructure utilised in SOP's is 'off-the-shelf' and is not considered a competitive advantage by most organisations. Companies are concerned with the technology's capability, reliability and interoperability. Major technology challenges include the quality and reliability of sensors, data transmission capacity and processing speed.

How the technology is connected is of paramount importance. Having a common architecture and IT architecture principles provides a standard approach to enabling data flows (e.g. from sensor to desktop) between different classes of applications independent of local legacy systems, which alleviates local implementation problems. The associated technology standardization provides a consistent way of connecting to application portfolios and informational resources and enabling the rapid deployment of applications and associated processes. An example of this approach is BP's Real Time Architecture Project (RTAP) which manages the capture, publication and distribution of real time operational data.

### People

In a recent study conducted by Capgemini it was shown that operators in Norway have not been limited by technology in gaining the benefits from Smart Operations. It was how the technology was implemented and utilised that made the difference. People play an important role in the successful



uptake of SOP's, both in terms of culturally accepting new concepts, and in having the right skills and competencies to manage and leverage its technological advantages and benefits.

'Cultural Drag' must be overcome; the question 'why should I change the way I'm working, it's worked for the last 10 years!' is often heard in Smart Operations initiatives. The successful implementers have managed to overcome this barrier in a number of ways including building a strong sense of personal ownership by the individuals involved, utilising newer personnel with less inbuilt resistance to new approaches or having senior executives actively sponsor programmes and engaging workforces in 'Town Hall Meetings'.

The utilisation of SOP's can lead to the necessity for cross-training. In offshore environments fewer personnel are required and individuals now have to fulfil multiple roles. Whereas onshore Operations and Drilling Centres require staff to have very particular skill sets in order to function in the dynamic real time data intense environment.

Additionally, new technology will always require new skills and competencies that companies must grow.

## Process

Managing the changes associated with the transition from traditional operations to Smart Operations is considered to be absolutely critical to the realization of the full potential afforded by Smart Operations. For example, Onshore Drilling and Operations Centres have changed the way people work and are a new way to organize an operation. These collaboration arenas necessitate dynamic interaction between people, across disciplines, companies and places. Therefore companies must consider what roles can be successfully embedded onshore, how do data flows & real time data processes have to be altered to support the change, how associated work flows impacted are and what adjustments are required etc. A variety of approaches have been adopted by the more successful programmes, and companies have expended a considerable amount of effort. These have included process decomposition, stakeholder analysis, data and workflow analysis, risk assessment tools, workshops, cross training, engagement of suppliers etc. However, probably the most important element(s) exhibited by successful SOPs change management initiatives are having a clearly articulated vision and value proposition, which is sponsored by the Executive and supported by cross-functional leaders. Those operators with strong executive sponsorship and a process change focus are realizing the benefits from Smart Operations earlier than those who do not.

## Implementation

Implementation can prove to be an obstacle for Smart Operations. Building a business case and demonstrating value often creates a barrier for companies in the earlier stages of establishing a Smart Operations programme. There are many examples of point solutions that have demonstrable value, but creating an aggregated programme is more

difficult. The most apparent benefits to be realised and recorded are those associated with onshore drilling and operations centres where benefits can be directly correlated to Smart Operations activities. For example the savings derived from the reduction in the number of helicopter flights and associated offshore days. Other less tangible benefits such as fewer personnel or less time spent offshore or introducing new 'remote' working practices (e.g. utilizing instrumentation for integrity management rather than have an operator physically check equipment) remove people from harms way supporting the drive by oil and gas companies to improve HSE. Often the business case for Smart Operations is built around an operational cost reduction model; however Capgemini found that in Norway and elsewhere, although this was the initial benefit, more value was created through longer term production optimisation, better well placement and improved operational efficiency.

Associated with developing a robust business case is identifying and managing the risks associated with new technology. Developing risk analysis and impact studies is crucial. In a recent incident, a company tried to install a new type of well sensor. However, it was found that threading these sensors into the well proved extremely difficult and once in place their reliability was poor. In time the success rate will improve, but the learning curve will be very costly. Some companies take a more distanced view and only implement technology that has a well established track record. Although this has the advantage of reducing costly implementation mistakes, these organisations do not see the benefits of Smart Operations until much later.

## Strategy & Governance

Capgemini has found that the most successful Smart Operations programmes have well defined strategy and governance models

irrespective of whether the programme is global, regional or even project focused.

Organisations with global programmes such as Shell's Smart Fields™ or BP's Field of the Future have well defined visions, IT architectures, best practices, change management programmes etc. These may successfully produce 'fit for purpose' regional strategies based on their global programme principles. Other companies have built their strategies from the 'grass roots' upwards either based on distinct assets or regions. However, the major determinant of value generated from Smart Operations is the ability to execute a given strategy within the context of organizational constraints. Two primary characteristics of operations need to be considered when determining the "best practice" strategy;

### Asset Characteristics

Potential from a development and operational perspective establishes:

- Overall value potential
  - Types and feasibility of particular solutions
- The main variables include:
- Significant remaining recoverable reserves
  - High operational costs
  - High labor costs
  - Active or planned development drilling program
  - Access to key ICT components such as data transmission (high bandwidth fiber) network

### Organizational Characteristics

The primary determinants as to whether the full value potential of SOPs is realized are contingent on organization-specific factors, including:

- The degree of executive sponsorship, support and accountability
- The development of an articulated vision and strategy
- Integrated, multi-disciplinary asset teams being a normative organizational model

- A collaborative work environment particularly between on-shore/offshore personnel and across assets
- A focused and “purpose built” redesign of work processes
- A pragmatic approach to value measurement
- An ability to manage significant organizational change

These allow an organisation to see the potential and its ability to achieve it. Once a strategy has been established a governance model needs to be emplaced. Currently there does not appear to be a common model for Smart Operations, however it is critical for a team to have responsibility for the success of the programme. Today, there are at least three approaches (1) Central, (2) Regional and (3) Project. A combination of central and regional appears to be the most prevalent method for the larger Smart Operations programmes. In this paradigm central team(s) tend to focus on developing and managing strategy, business case models and technical standards whereas regional teams identify opportunities, adapt processes and demonstrate benefits to the organisation.

Another important aspect of successful governance is leadership. In the battle to win hearts and minds through the change process, it is important for the leadership to demonstrate operational experience. This credentialises the programme to the asset personnel far more effectively than if the initiative is managed through the IT function.

### Conclusion

A successful Smart Operations programme can deliver significant value. Through working with oil & gas companies on a variety of projects Capgemini consider that some of the potential benefits and the estimated size of the associated prizes to be captured are illustrated in Figure 2. As discussed, a programme that delivers both tangible and sustainable value must not focus on technology. It

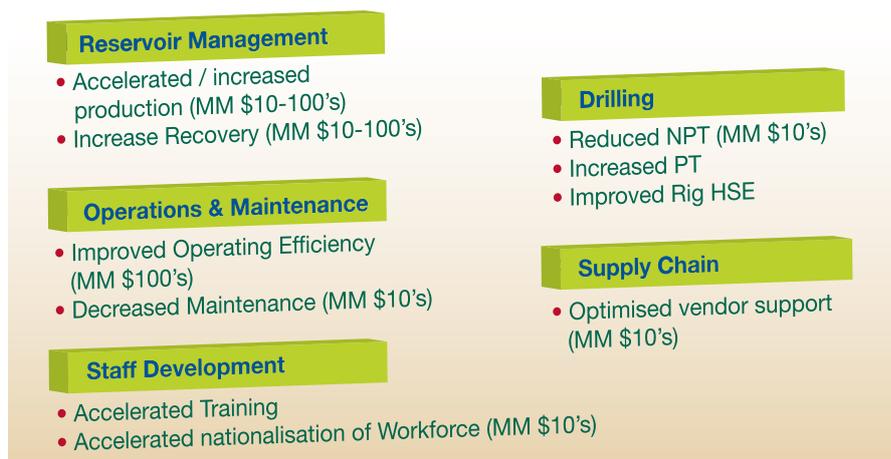


Figure 2 Potential value created by Smart Operations

should include changes to work processes and consider the direct impact on people and their routines. The programme must also be positioned within a strategic framework with clearly defined governance procedures.

As more companies start to invest in Smart Operations only those who adopt a structured and holistic approach to the design, implementation and execution of their programmes will see the full return on their time and money.



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For more information please contact:

**Spencer Roberts**  
+44 (0) 870 366 0511  
spencer.roberts@capgemini.com

**Patrick Quinlan**  
+1 403 444 5628  
patrick.quinlan@capgemini.com

**Ian Moore**  
+44 (0) 870 366 0474  
ian.moore@capgemini.com

**Leslie Le Quelenec**  
+1 403 444 5624  
leslie.lequelenec@capgemini.com

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