

DIGITALIZATION: A PRAGMATIC APPROACH

Exebenus outlines a pragmatic approach to digitalization for oil and gas operators, with a focus on drilling and completions.

Contributors, Exebenus

Olav Revheim

Co-Founder and CEO

Paal Bekkeheien

Co-Founder and Chairman

Anne Siw Uberg

VP Strategic Marketing and
Business Development

INTRODUCTION

In oil and gas offices around the globe, the word “digitalization” echoes from top suite to ground floor and desktop to rig, prompting a range of responses. At worst, anxiety – *What are we getting into? What is digitalization going to cost us in disruption and distraction?* And at best, enthusiastic commitment – *We’re already seeing improvements in productivity/costs/reliability. How can we take digitalization all the way?*

More often, the mood is somewhere in the middle. We know digitalization will help improve our performance, but it looks like a bigger job than we thought. There’s pressure from the top to accelerate the return on our investment.

Let’s look at the subject pragmatically, addressing some of the most common questions we hear:

- What do we mean by digitalization?
- Is it optional?
- How big is the commitment?
- What is the pay off?
- How can we best implement digitalization?

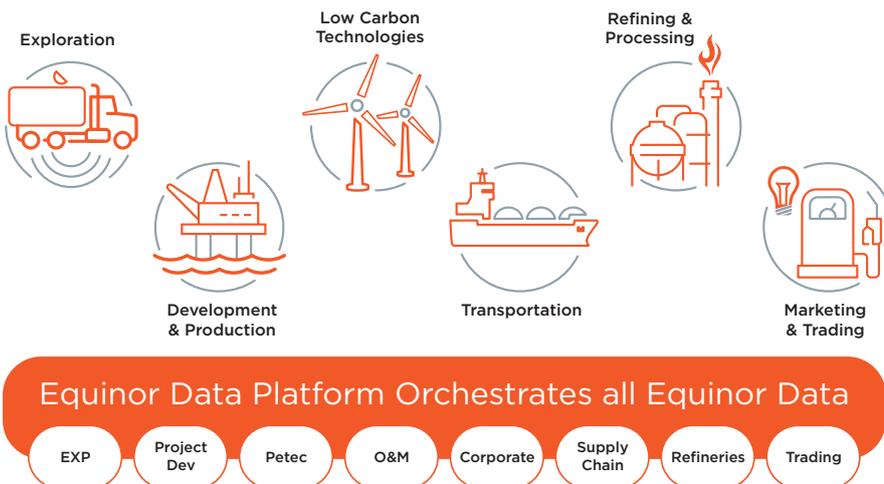
WHAT DO WE MEAN BY DIGITALIZATION?

Digitalization generally refers to the process of enabling and improving business operations by maximizing the use of digital technologies and data to create actionable knowledge. It may lead to automation of some processes.

As Forbes contributor Jason Bloomberg writes, *“Digital transformation initiatives will typically include several digitalization projects... In the final analysis, we digitize information, we digitalize processes and roles that make up the operations of a business, and we digitally transform the business and its strategy. Each one is necessary but not sufficient for the next...”*¹

In this paper, we are interested in digitalization within oilfield operations, which like any digitalization project requires a data management system wherein data of known and consistent quality is organized and made accessible to those who need it. Context is key: Certain people need access to specific information at a precise point in a workflow to accomplish defined tasks and achieve a desired result. In short, information, people and processes need to be tailored and synchronized for true digitalization to be achieved.

Enabling digitalization requires data from many silos to be available to people as they need it in their specific workflow. Equinor (previously Statoil) have created a platform that orchestrates the data flow between the various disciplines and work processes.



“

...INFORMATION, PEOPLE AND PROCESSES NEED TO BE TAILORED AND SYNCHRONIZED FOR TRUE DIGITALIZATION TO BE ACHIEVED.”

From small silos of data... to one common data platform for the Equinor Value Chain

(Illustration adapted from presentation given at Energy World 2018 by Equinor.)

IS DIGITALIZATION OPTIONAL?

Yes. But, no. Digitalization is not optional if you want to maximize your potential.

In oil and gas, as in most industries, digitalization has become essential for thriving amid a rapidly changing environment: A market environment of fluctuating oil and gas prices; an operational environment that demands efficiency, optimized resources, and streamlined processes to lower costs and address more complex technical challenges; a recruiting environment of heightened competition for a generation of technically savvy talent; and a technology environment that is heading inexorably toward automation.

HOW BIG IS THE COMMITMENT?

The prospect of digitalizing oilfield operations can be daunting. It's best to think of the process as an evolution, not a revolution. Small sips, not one big gulp.

So, start by zeroing in on the highest impact improvement you could make. Universally, that means reducing costs or increasing production, which in our experience turns the conversation towards improving operational efficiency and reducing nonproductive time (NPT), which in turn focuses attention on the domains of drilling and completions.

So, the commitment can be defined, but your digitalization program nevertheless represents change, which creates uncertainty. A pervasive fear is business disruption, and to avoid that happening, it is essential to set clear goals up front, have ownership from the top down, achieve buy-in at all levels, manage day-to-day expectations and communicate consistently.

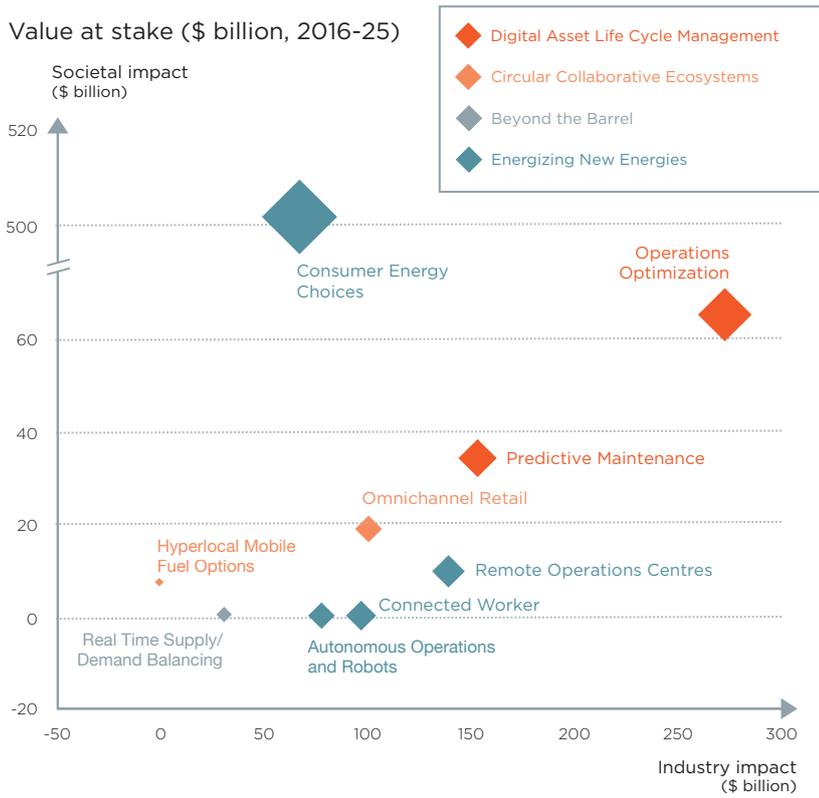
HOW WILL DIGITALIZATION PAY OFF?

In a 2017 paper entitled *"Digital Transformation Initiatives: Oil & Gas Industry,"* the World Economic Forum refers to digital asset lifecycle management, stating that optimizing operations through digitalization has the potential to unlock the greatest value (approximately \$275 billion) for the industry, *"of which 90% could accrue by optimizing drilling and production, and from leveraging the data from end-to-end connected assets to feed advanced analytics algorithms. This reduces costs related to nonproductive time and improves resource productivity."*

“

...DIGITALIZATION
IN THE OIL AND
GAS INDUSTRY HAS
THE POTENTIAL
TO UNLOCK
APPROXIMATELY
\$275B ... OF WHICH
90% COULD ACCRUE
BY OPTIMIZING
DRILLING AND
PRODUCTION...”

WORLD ECONOMIC FORUM

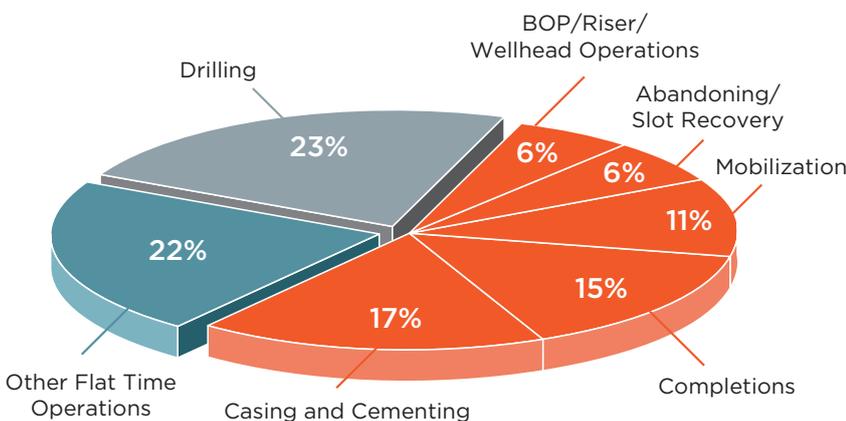


Focusing on optimizing operations, using remote operations centers, and applying autonomous operations and robotics make up roughly \$100 billion of the available value. Digitalizing even a portion of these elements represents a significant potential pay off.

Note: Diamond size represents the total impact in 2025. Societal impact includes the economic impact of emissions (CO₂ equivalents, SO₂, NOX and CO), reduction in water usage and oil spills, time savings, and reduction in costs to customers. Emissions have been converted into monetary equivalents by using the concept of social cost of atmospheric release (1 ton of CO₂ is equivalent to a societal impact of \$97).

Discussions of cost reduction tend to focus on drilling, but ExxonMobil noted in a 2014 SPE paper (SPE 170751) that, as a result of drilling efficiency gains, nondrilling activities account for roughly 77% of rig time during drilling and completions operations. Of that, 22% is the sort of unspecified downtime, such as waiting on weather or rig access, that is difficult to affect.

We believe that the remaining 55% of nondrilling time contains opportunities to improve on speed through such strategies as automation, digitalizing workflows, scrutinizing and improving invisible lost time (ILT) factors such as pipe connection times, incident scenario simulation, and providing thorough procedural instructions to manage tasks and handle deviations.



During drilling and completions operations, 55% of nondrilling time presents opportunities for significant improvement through digitalization.

Humans Get a Bad Rap

According to a 2016 RAND Corporation study performed for Total E&P, 80% of NPT is attributed to human error.³ Within drilling and completions, operators point to the tenuous bridge between well planning and execution, where information is exchanged between office and rig. This is the two-way juncture where it seems all too easy for information and instructions to be incomplete, inconsistent, delayed, misinterpreted or ignored.

In a SPE paper entitled, “An Electronic Rig Action Plan: Information Carrier Equally Applicable to the Driller and the Automation Platform” a North Sea operator notes that the level of detail and the language used in a rig action plan depend largely on the approach of the humans who prepared the plan. *“The information can be too excessive or too limited; operational parameters can be too conservative or too risky, often lacking standard guidelines.”* The paper illustrates the cost of human inconsistency, describing one incident when an operator was forced to run the same BHA three times in one week because of intermittent fishing operations. A comparison revealed that for the same activity of 1.5 BU (Bottoms Up) circulation, one rig action plan had a flow rate of 1500 lpm, while two others had a flow rate of 750 lpm. Flow rate of 1100 lpm was used in the operation. For a normal North Sea well, such a difference in flow rate for 1.5 BU circulation represents several hours of offshore rig time.⁴

But are humans really to blame for human error?

The same RAND study cited above suggests that we should not be too quick to blame humans for NPT.³ It links human error with the wider system context: *“Analyses now suggest that while the human factor element directly induces most accidents, this is only the ‘first order cause’ of an accident history based on pre-existing organisational factors. While human factors approaches ask the question: ‘who caused the accident?’, organizational approaches also ask: ‘what conditions and mechanisms have increased the possibilities of it happening?’, ‘how and why did the defence systems fail?’, and ‘what can we do so that the event will not be repeated?’”*

“

A NORTH SEA OPERATOR NOTES THAT THE LEVEL OF DETAIL AND THE LANGUAGE USED IN A RIG ACTION PLAN DEPEND LARGELY ON THE APPROACH OF THE HUMANS WHO PREPARED THE PLAN.”



HOW CAN WE BEST IMPLEMENT DIGITALIZATION?

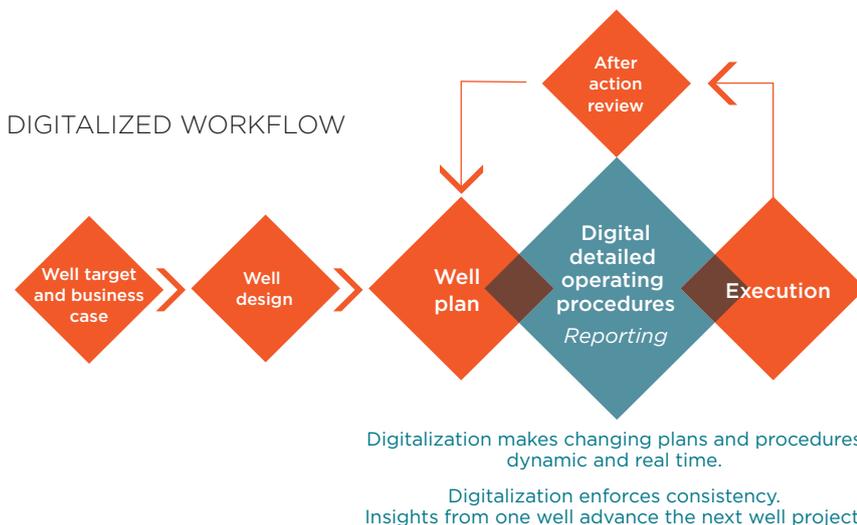
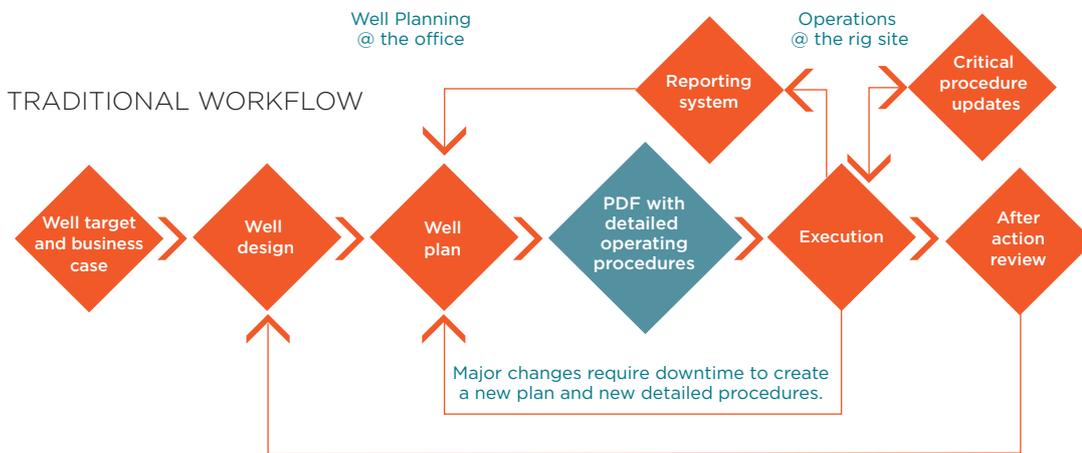
We know the goal is reducing NPT. The context is well drilling and completions operations. And the weakest link is the exchange of information between office (planning) and rig (execution), where errors and inconsistencies tend to occur. We also know that humans are not always to blame.

The job of digitalization, then, is to make sure that technology-driven processes and organizational structures offer humans their best chance of success.

Addressing the critical link between office and rig

We propose digitalizing the planning and execution phases to address the critical link between office and rig, creating a dynamic handover.

A typical engineering workflow involves a sequence of steps – plan, execute, evaluate, improve. By providing the team with the ability to automatically generate validated, detailed digital operating procedures, digitalization compresses the time and distance between well planning and execution, strengthening the two-way exchange of mission critical information. Suddenly the two formerly sequential steps can be done to a large extent in parallel. Dynamic. Responsive. Synchronized in real time. In this context, evaluation and improvement start to nest within the planning and execution processes, turning a four-step sequence into a dynamic planning and execution work process.



The workflow from the well business case through well planning and operations, highlighting the impact that an operational change can have on the operating procedures and surrounding work processes.



Consistent and verified operating procedures

To extract this value, we recommend merging data (structured and unstructured) into a digital library that contains the best available tool and technology options from multiple service providers, along with relevant insights drawn from other projects.

The digital library links the tools with their parameters and tool-specific insights gleaned from experience, such as lessons learned, best practices, checks and risks. As the products are selected and the tool string built, the library automatically checks choices for fit, validates the design, and assembles the operating procedures and insights. The procedure framework is completed, wording is standardized to avoid human misinterpretation, and procedures are validated and consistent. Wellbore specifics can be assigned to the procedure along with checks and risks. The digitalization removes subjectivity and the associated risks. Updates can be quickly and dynamically generated as operations unfold.

Digitalization of the procedures makes it possible to use a real-time WITSML data feed to recognize the actual activities versus planned activities in real time. This provides clarity regarding the timeline (no more waiting for an activity to be finished when it actually is finished), and it enables predictive decisions and actions, flagging deviations from plan and maintaining safe windows of operation.

With digitalization, the validated, digital detailed operating procedures become machine-readable. Therefore, by digitalizing the exchange between office and rig, we not only fortify the critical link between planning and operations, we also initiate autonomous operations, an important step toward automation of drilling and completions.

DIGITALIZATION
MAKES OPERATING
PROCEDURES
MACHINE-
READABLE....
AN IMPORTANT
STEP TOWARD
AUTOMATION OF
DRILLING AND
COMPLETIONS.

REFERENCES

1. James Bloomberg. Digitization, Digitalization, and Digital Transformation: Confuse Them at Your Peril. *Forbes* 2018
2. Digital Transformation Initiative, Oil and Gas Industry, World Economic Forum January 2017
3. Kate Robertson, James Black, Sarah Grand-Clement, Alexandra Hall. Human and Organisational Factors in Major Accident Prevention, A Snapshot of the Academic Landscape, *Rand Europe* 2016
4. L. Ruså Solvi (Aker BP), O. Revheim (Exebenus), S. Schaefer (Exebenus), F.J.Schutte (Aker BP). An Electronic Rig Action Plan - Information Carrier Equally Applicable to the Driller and the Automation Platform. SPE-195959

EXEBENUS

▀ PULSE

Exebenus Pulse digitalizes the information exchange between planning and execution to increase productivity and reduce NPT during drilling and completions operations. At the heart of the solution is a customized, digital product library containing your approved equipment and tools linked to associated tasks, technical functions, operating parameters and insights from past projects. It automatically generates validated, detailed operating procedures.

During execution, as real-time data start to flow, Exebenus Pulse recognizes and validates activity execution and flags each point of operational criteria as it is met or not. It alerts the crew when operations deviate from plan, and when equipment limits are reached or are near breach, to ensure activities remain within the safe operating window.

Exebenus Pulse is an independent, neutral solution that interfaces with standard software and fits into existing workflows without infringing on the intellectual property of the equipment and tool providers. It can incorporate any real-time WITSML data and can integrate with any data store.

Exebenus AS
Kanalsletta 2,
4033 Stavanger,
Norway
+47 917 63 400
info@exebenus.com



Copyright © 2019 Exebenus AS.
Exebenus and **Exebenus Pulse** are registered trademarks of Exebenus. All other products and marks are owned by their respective companies.