Cognitive Drilling Advisor translates human cognitive capability into a continuously self-improving 'Machine Cognitive Expert'

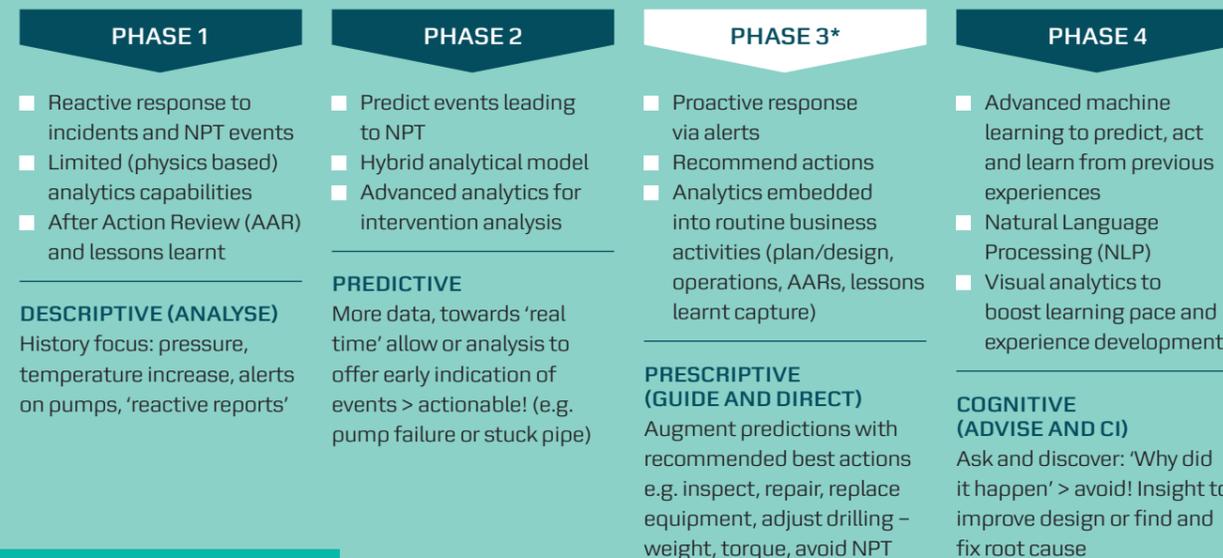| PHASE 1	PHASE 2	PHASE 3*	PHASE 4

PHASE 1
- Reactive response to incidents and NPT events
- Limited (physics based) analytics capabilities
- After Action Review (AAR) and lessons learnt

DESCRIPTIVE (ANALYSE)
History focus: pressure, temperature increase, alerts on pumps, 'reactive reports'

PHASE 2
- Predict events leading to NPT
- Hybrid analytical model
- Advanced analytics for intervention analysis

PREDICTIVE
More data, towards 'real time' allow or analysis to offer early indication of events > actionable! (e.g. pump failure or stuck pipe)

PHASE 3*
- Proactive response via alerts
- Recommend actions
- Analytics embedded into routine business activities (plan/design, operations, AARs, lessons learnt capture)

PRESCRIPTIVE (GUIDE AND DIRECT)
Augment predictions with recommended best actions e.g. inspect, repair, replace equipment, adjust drilling – weight, torque, avoid NPT

PHASE 4
- Advanced machine learning to predict, act and learn from previous experiences
- Natural Language Processing (NLP)
- Visual analytics to boost learning pace and experience development

COGNITIVE (ADVISE AND CI)
Ask and discover: 'Why did it happen' > avoid! Insight to improve design or find and fix root cause

Figure 1: Road map from predictive to cognitive analytics. *current phase

SEEING THE FUTURE:
FROM PREDICTIVE TO COGNITIVE ANALYTICS

By Joy Sunday Oyovwevotu

What if there was a technology that could alert you to the possibility of expensive mistakes before they happen? Imagine the competitive advantage such a technology would offer. The Predictive Drilling Analytics (PDA) project was conceived to deliver just such a capability, but it's just the start of our journey towards cognitive analytics.

The PDA project is a collaborative effort between Maersk Oil and IBM to produce a model that can predict undesirable events before they occur, using real time (RT) data and other sources. This model is exclusively focused on drilling challenges in the overlying rock formations (or overburden) in the Danish sector of the North Sea. Although predictive drilling has exciting potential, it is only a waypoint on the journey towards cognitive analytics. Cognitive analytics in drilling will enable a drilling engineer to draw on lessons from thousands of wells and the organisation's collective drilling-domain knowledge (from structured and unstructured data), improving efficiency and consistency of performance. A fully functioning cognitive system will identify risks from historical data and provide advice on possible ways of dealing with emerging challenges. In this future, cognitive analytics will be the drilling engineer's partner in a continuous effort to improve drilling performance.

CREATING AN INITIAL PREDICTIVE MODEL

Today, we are working with IBM to develop a predictive model that can set us up for this exciting future. Drilling challenges in the overburden result in significant non-productive time (NPT) that increases well cost and affects our drilling performance relative to our peers. In the past, we have been unable to use our knowledge and experience to combat these challenges, because carefully planned and well calibrated solutions have produced patchy results in different wells. Solutions based on past experience can be backward looking and fail to account for evolving subsurface changes. There is also the limitation of human cognitive ability to recognise critical relationships between drilling parameters, practices and NPT events.

The PDA model combines analysis of past events from historical data with extensive drilling knowledge, using the power of analytics to provide an 'early warning system' to avoid significant non-productive time (NPT) events.

TESTING – AND WHAT COMES NEXT

The PDA model will be tested in a field trial in May 2017. If successful, the model will begin to be used across the business to avoid NPT events, improve drilling efficiency and support operational decision making. At the time, the model will self-learn by ingesting a wider universe of data, leading to even better predictions. Critically, a successful PDA trial will prepare us for a future with cognitive analytics. ■
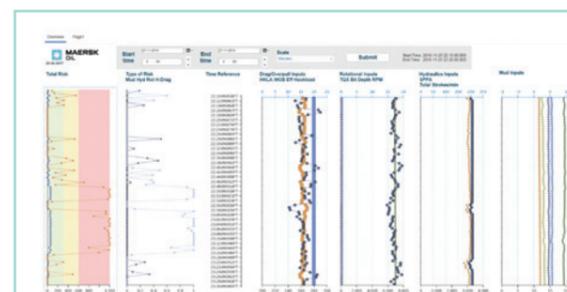
Figure 2: Visualisation of risk along with causes or drivers of predicted risk

At a glance

Purpose:
Predict and avoid non-productive time event

Technology:
Data analytics

Impact:
Reduce well construction time and cost and boost operational efficiency

Completion date: Q3 2017