AIM HIGH, START SMALL

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argue that new, 'revolutionary' data tools can best be introduced to the industry through collaboration and achieving well-defined, basic objectives.

The oil and gas industry is currently talking up the importance of data analytics, machine learning, and AI (Figure 1). A hyper cost-conscious market continues to fuel the urgency for operators and those in the service sector to maximise productivity and minimise inefficiencies. In order to raise the performance bar overall, companies recognise they must embrace advanced analytics or be left behind a constantly shifting technology curve. A recent GE/Accenture report survey showed that 81% of senior executives believe that Big Data analytics is one of the top three corporate priorities for the oil and gas industry through 2018.[1] The seemingly boundless potential of Big Data has led to numerous conceptual promises but, so far, very little in terms of concrete delivery.

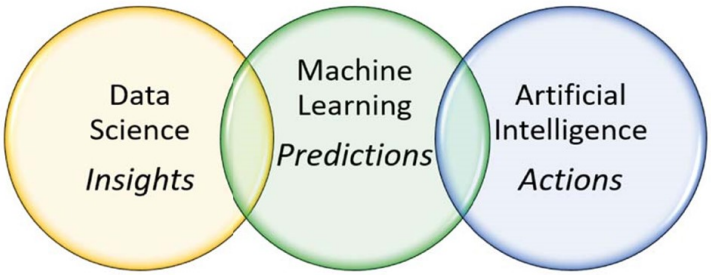

Figure 1. *Comparison between data science, machine learning, and AI.*

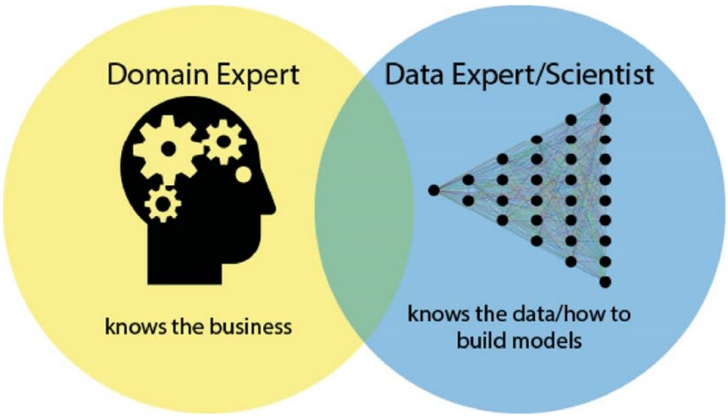

Figure 2. *Collaborative overlap needed for domain experts and data experts/data scientists.*

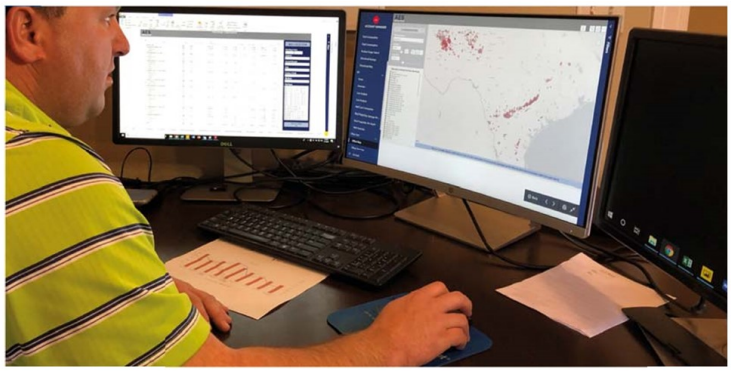

Figure 3. *Account manager utilising AES Analytics for an upcoming KPI meeting.*

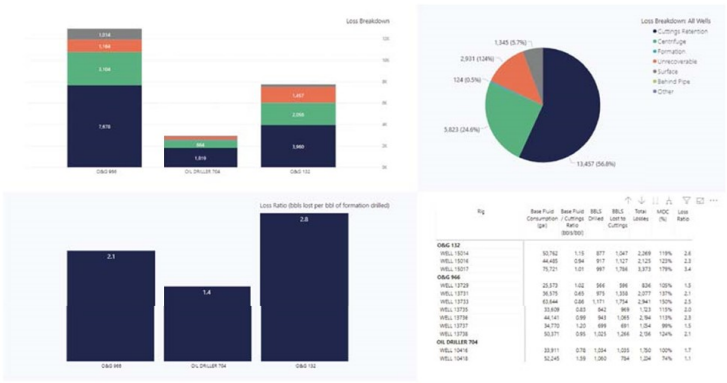

Figure 4. *Dashboard visualisation comparing drilling fluid losses across 12 wells drilled by 3 rigs.*

The problem lies in the overly generalised promises of data tools. The data tools delivering real value today originate from small, specific tasks, and expand their scope as these niche applications deliver results. The transformation is not only centred around data, but also a cultural shift and understanding that many time-consuming tasks can be simplified through a new approach.

Introducing data tools that start with an initial area of focus not only avoids 'mission creep', it also unites a small group of data scientists and domain experts through the establishing of an achievable task (Figure 2). Domain experts are essential to defining the need and evaluating the utility of the deliverables provided by data scientists. In ideal cases, the domain expert also acts as the data scientist to make the toolset as useful as possible for their day-to-day role.

By way of example, using the analogy of self-driving automobile technology, an experienced data scientist who has a limited understanding of fundamental automobile designs and concepts will fall short of developing an impactful analytics platform without the input of their domain expert counterpart.

Analytics platform development

For the development of AES ANALYTICS, a drilling fluid data analytics platform designed by AES Drilling Fluids, account managers and field specialists worked directly with data scientists, including those with field experience, to develop the initial toolkit. A key differentiator from general data analytics tools is that while many of these can report on the best drilling fluid properties, an expert-driven platform offers insight into the lowest-cost means to achieve and maintain these best-practice properties.

The foundational data tools of the platform were built from fluid reports, in particular comprehensive drilling fluid recaps generated at the end of the well. These data sets are regularly reviewed as offset information to improve upon performance drilling future wells. Furthermore, customers regularly ask for data sets to evaluate their own performance. Key performance indicators (KPIs), such as cost, performance, and drilling fluid properties, are reviewed on a quarterly basis.

Historically, this data was gathered manually or through database queries in advance of planning or review meetings. This time-consuming, repetitive task took personnel away from monitoring activity and identifying best-in-class performance criteria for the customer. Data analytics was a clear opportunity to answer the same questions through the click of a mouse.

The platform's first dashboards focused on answering the most common questions for well planning and KPI meetings (Figure 3). Topics included mud weights, drilling fluid losses, product consumption, cost vs days, and comparisons between drilling rigs (Figure 4).

Clear visualisations and the ability to investigate interesting data points by sliding or clicking on a graph provides access to information quickly, but it also reveals erroneous or incomplete data. Over the years, errors can accumulate and require a thorough quality control review. A substantial amount of the initial work centred around verifying data sets.

With a validated data structure, the platform was slowly deployed to customers and account managers. An email account was set up to address any errors and for new feature requests. The customer dashboards, centring around KPI metrics, were made available through an individual, unique login. The ability to expand the technology from its core

processes to added features was fuelled in part by end-users and feedback from operational personnel.

Use cases

Following a KPI meeting, a customer requested certain changes to cost benchmarks that would better illustrate their specific concerns. The platform's flexibility meant that the updates were made in minutes across all wells for an easy comparison of the entire drilling campaign's history.

While data analytics platforms continue to claim headline-worthy gains, most of the efficiencies are in the details. For example, AES ANALYTICS' geo-fencing capabilities offer quick insight into well risks based upon GPS coordinates and wells within a specific radius. The targets are adjusted by depth, which is critical when considering many unconventional developments in the same area target different formations. When risks are mitigated in advance, it is difficult to capture the true cost savings of non-events until they accumulate across multiple wells (Figure 5).

In one basic example, a drilling consultant in the field requested the addition of more wetting agent than programmed. Using the platform, the account manager overseeing the operation was able to demonstrate that the current treatment regime matched all of the nearby wells. This data-driven answer prevented a costly overtreatment, saving the customer nearly US$6000.

In another example, the customer asked for a review of barite consumption during a meeting. Typically, this would require the data to be gathered and a separate meeting scheduled to discuss its implications. Instead, the account manager opened the platform, presented the data, and an informed decision was made on the economics of barite recovery for a solids control set-up.

While many visuals are best observed on a single or dual monitor set-up, the platform is available for mobile devices (Figure 6). This allows for connectivity almost anywhere; whether at the rig site or in an impromptu discussion, there is no lag between information and informed decisions.

Its capabilities, from core processes to added features, are now being expanded, as a result of feedback from end-users and operational personnel. New features expand the original data sets to even greater detail, along with new opportunities for usage of the data.

In the Permian Basin, US, mud weight selection is extremely challenging. Highly variable pressure regimes and unexpected loss zones create significant uncertainty. To assist customers with better information, a new tool provides a statistical breakdown of mud weights in the area and subsurface losses encountered. The distribution helps to determine the mud weight most likely to be effective for drilling a target formation.

As the system matures, new features provide more and more of the answers to questions that were not easy to answer without first taking time to investigate and respond. Faster, more informed decisions yield better results, instead of isolated information or cases from memory.

The benefits realised by users continue to lead to more features and greater adoption. Data-driven solutions are now the standard as the evolution of decision-making processes and simplification of data-gathering tasks takes place.

The aggregate deliverables of the system are starting to deliver noteworthy value, but it began through collaboration between experts and data scientists, and a basic objective. With a robust, standardised data structure, the future of data science extends beyond just visual analytics. With the foundation set, machine learning provides the potential to automatically review reports and suggest responses. Predictive modelling can identify the greatest risk to wells and determine the most cost-effective risk-mitigation techniques.

Someday in the not so distant future, it will be possible to turn some decisions over to an AI engine within the platform. Consider a well-control event where the mud engineer is on the pits weighting up the system for a killing operation. Barite consumption is noted, along with the event in real time, and an order is placed. Trucks are on the road, without having to leave a critical activity to place an order, and arrive in plenty of time.

Conclusion

Big Data is the future, and its boundless possibilities make it difficult to know where to start. The promise of identifying serious bottlenecks and rapidly delivering prescriptive actions to ensure optimal operating conditions has left everyone racing to implement new tools. As companies throughout the industry continue to struggle with large amounts of valuable data, one thing remains clear: a data analytics platform built on a sound foundational data structure will deliver pragmatic, concrete results. This positions the technology for future developments in machine learning and AI.

Reference

1. Accenture, 'Industrial Internet Insights Report for 2015', www.accenture.com/us-en/_acnmedia/Accenture/next-gen/reassembling-industry/pdf/Accenture-Industrial-Internet-Changing-Competitive-Landscape-Industries.pdf (2015).

Figure 5. *Dashboard visualisation comparing various cost metrics across a multi-well drilling campaign.*

Figure 6. *Drilling fluids engineer reviewing offset fluids data through the mobile app.*