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Event Report, How to use Analytics to improve Production, Sept 29, 2015, Aberdeen

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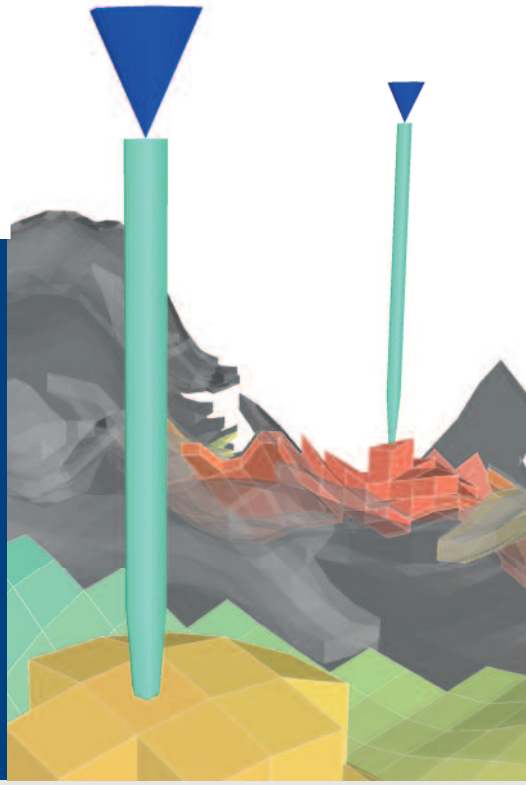

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How to use analytics to improve production

Digital Energy Journal's Aberdeen conference on Sept 29 2015 explored how man and machine (or woman and machine) can work together to achieve the best results in production

In the world of chess computing, "every chess player will agree that the combination of a human plus a chess computer program are absolutely unbeatable," said Sergio Sama Rubio, Industry Solutions Advisor with Halliburton, speaking at the Digital Energy Journal conference in Aberdeen on Sept 29, "Using Analytics to Improve Production".

It should be similar in the world of oil and gas production. If you can combine the human's strengths (strategy, designs and choices, objectives and decisions) with the computer's strengths (repetitive tasks, running models, optimising and training) you can work out the best way to get the most production and maximum safety with your resources available.

Dr Duncan Irving of analytics data platform company Teradata said that oil company staff will typically hand one data file onto the next person in the chain with no-one keeping track of the algorithms or models used to create it.

By the time the data is used to make a decision, sometimes the only version of the data is on a PowerPoint slide. "This is not the same of pretty much any other industry Teradata works in," he said.
Scott Harrison of Scottish Enterprise said he had been speaking to a senior leader from an oil and gas maintenance company, who pointed out that he gets paid in terms of man hours from sending staff offshore to fix things. It might be better for the client if he could do predictive analytics and only fix things which need fixing, but not better for his company.

The conference was not all negative. Tom Fox, a former field development engineer with Shell, explained how to bring together commercial, production and maintenance staff together to work on a production forecast, all putting their respective expertise into developing and accessing a model which they can access through a web browser.

Duncan Hart of Data Lab offered the resources of Scotland's academic community to assist with any data problem the industry has, with funding from the Scottish government to pay for it.

Oludare Elebiju of Enginsoft explained how companies can set up a central data repository for all reservoir data, using technology originally developed for a very large Brazilian oil and gas company.

Halliburton's Sergio Rubio explained how setting up well structured 'workflow' systems is a great way that oil companies can harness the expertise of retiring staff members. Jonathan Guthrie explained how you can start small with an analytics problem to prove it works, and Duncan Irving explained how the goal is to achieve a far more 'sentient' organisation – one which has a much better understanding of what is going on.

It isn't an easy time to be selling technology or services – energy consultant Jonathan Guthrie told a story of how he identified an opportunity for an oil company to accelerate and deliver a potential £15m of business value. The initial analysis was made from the oil company's own data. To validate and complete the analysis would require a short-term commitment of £15k from the operator. But was then told to cut his consultancy fees by 10 per cent because 'that was company policy'. He walked away from the business.

But the current oil price environment means that many companies have more time to evaluate better data technologies and pressure to see if they can deliver results. But can they get past the senior management who prefer to "just do the same rubbish we've been doing because it feels safe"?

Scottish Enterprise – understanding big data

Scottish Enterprise has been looking into 'big data' since spring 2014 to find out what value it can actually add, said Steve Harrison, project manager with Scottish Enterprise.

It wants to help oil companies separate hype from reality with analytics. If all the hype was true, "we'd find oil in a second, we'd be able to maximise production and turn it into dollars," he said.

Senior management are asking for more 'evidence'. "We've been working with leadership to understand what evidence they need," he said.

Another challenge Scottish Enterprise is looking at is improving the goal alignment between operators and suppliers. For example, the incentives for predictive analytics are not as great as you might think. A senior leader of a maintenance company once told him, 'I get paid for the man hours for people who go out and fix kit. No-one will pay me for telling them when it's going to break.' Mr Harrison said.

Scottish Enterprise wants to help operators and service chain companies to help make the UKCS more competitive, and help the companies develop into international dominant players, he said. But also consider that the main objective of government, which pays Scottish Enterprise's bills, is often jobs, not competitiveness.

Watch Steve's talk on video at
www.digitalenergyjournal.com/video/1739.aspx

This special edition of Digital Energy Journal is an Event Report from our forum in Aberdeen on September 29, 2015, "How to use Analytics to improve Production".

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Together we can improve production forecasting

Production forecasting is a critical task in the oil and gas industry, and is best if you have a mixture of complex modelling and the combined expertise of people from many different disciplines. Tom Fox explained how to do it.

Oil and gas asset managers need reliable production forecast information so they can take better decisions about how to maximise value from every well. And making better production forecasts needs a mixture of analytics and human expertise.

"Analytics are the key to understanding past production, but analytics alone fail to make an optimal forecast," said Tom Fox, managing director of production consultancy 1234most, and a former field development consultant with Shell, speaking at the Digital Energy Journal Aberdeen conference on Sept 29 2015, "Using Analytics to Improve Production."

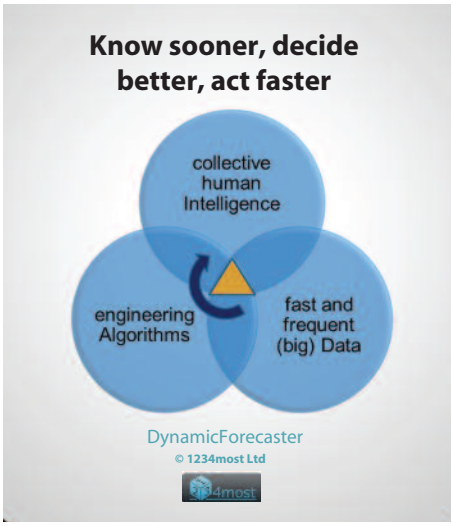
"A digital solution is an incomplete solution. If we leave out the people, that digital solution is probably useless," he said.

Production planning is complex because it must reconcile three perspectives: commercial, production and maintenance.
Typically, these are three separate analysis flows which involve different expertise and diverse software, he said.

There are also uncertainties in both the modelling methods and the input data, so case studies are needed to assess a range of future scenarios.

Big data techniques, such as machine learning, offer a tempting shortcut to decision support, he said.
But if you skip the laws of engineering and physics, you can end up overloaded with false alarms mixed with false positives.

Engineering and maintenance models, calibrated by historical analysis, are essential to make valid predictions.



Need to be integrated

The Piper Alpha disaster is a sobering reminder of the human and commercial costs of management failing to make good decisions, due to weaknesses in the integration of complex activities Mr Fox said.

More than twenty-five years later, with low oil prices, we are once again under huge commercial pressure to keep production flowing, in order to defer asset abandonment costs. The resulting imperative is to to carry out maintenance activities at minimal cost and with reduced downtime.

Complex decisions are especially prone to psychological decision traps. Sadly, we are not as rational in practice as we claim to be in textbooks and management courses, Mr Fox said.

The best antidotes to these psychological traps are collaborative decision-making and explicit recognition of the various forms of traps, he said, in some lessons taken from the 1999 book "Smart Choices" by Howard Raiffa and Ralph L Keeney.

Collaborative decisions

Collaboration deserves purposeful investment of time, energy and money, Mr Fox said.

Everyone makes decisions, at all levels in the organisation and in all locations. When we involve more people in taking production planning decisions, the decision process must evolve to handle the increased complexity.

For example, instead of a binary yes or no, the gradients of agreement scale is a subtle solution to encourage greater participation in the decisions, as well as more reliable commitment to implementation.
"My vision is that we extend the decision-making and the analytics across the entire organisation, from the operators in the field to the management board room; that everyone can get a vision of how the operation works, how it can be optimised and that everyone can be involved in making the plans that implement efficient and economic production," said Mr Fox.

One way to implement this vision would be to develop a collaborative business process for production forecasting, together with server-hosted software which whole asset teams can use..

A production planning process

Mr Fox presented a production planning process based on a cycle of continuous improvement, which integrates expertise across the organisation from field operators to senior managers.

This process combines and integrates several proven techniques: 'Produce the Limit' workshops, multi-scenario planning, participative decision-making, delegation of responsibility to well-informed operators and quantitative 'After Action Reviews'.

With web enabled software, non-specialists can access analytics and modelling systems remotely. This way they can make a better contribution to the planning process and they can even experiment with their own ideas.

Analytics and optimisation together

To demonstrate that there is high, incremental value accessible from analytics and optimisation, Mr Fox presented a case study on the optimisation of gas lifted oil wells.

Faced with uncertainty in the future rate of gas lift supply, optimised field-wide solutions must be precomputed for a range of scenarios.
When compared with the base case (of what would be expected from a skilled and experienced operator) total oil production is significantly increased by using an

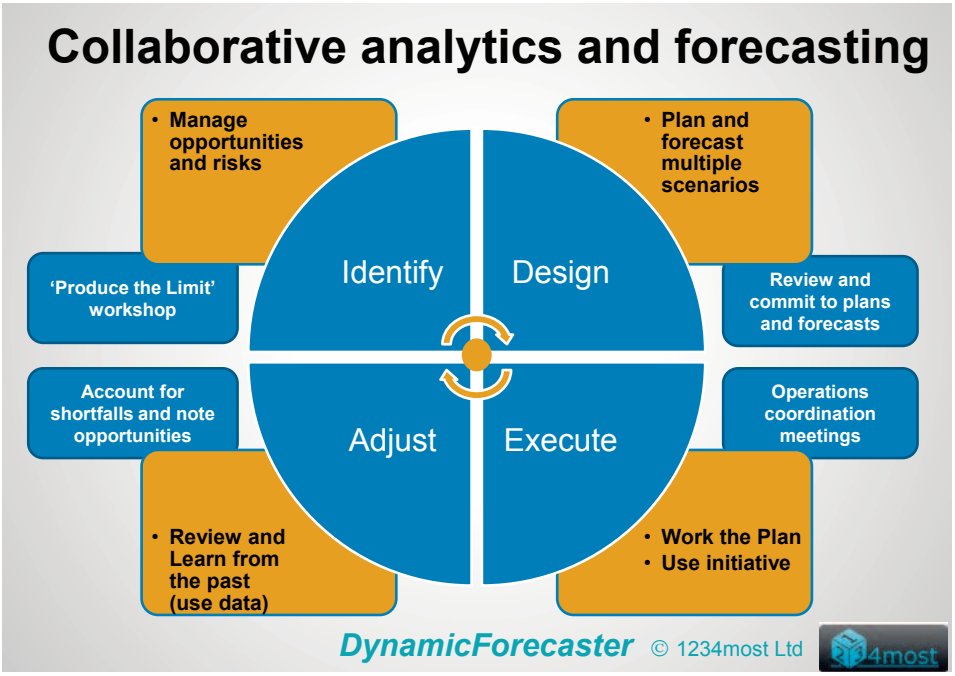
advanced optimisation algorithm on numerous gas lift performance curves (obtained by analytics).

DynamicForecaster

DynamicForecaster is a multi-user web application for collaboration on both production analytics and forecasting, developed by Mr Fox's company, 1234most.

It helps asset managers in upstream oil and gas companies who want to improve the financial return on investment, by using the insights from multiple users.

Asset teams can now make quicker and more varied analyses of past and future production, leading to better quality decisions and implementation. Further information is online at dynamicforecaster.com



View Mr Fox's video and download slides at
www.digitalenergyjournal.com/video/1619.aspx

Teradata – how to get value from analytics

Other industries have managed to get value from analytics – it is time the oil and gas industry followed, said Teradata's oil and gas practise lead Dr Duncan Irving

In the oil and gas industry it is typical for data to be handed from one expert to another along the workflow, with nothing captured about where the data has come from and whether it can be trusted.

"By the time it has got to the person who needs to make the decisions it's got to PowerPoint, and there's no understanding of the algorithms (used to create it) or any sense of data lineage – time is wasted re-establishing trust in the data", said Duncan Irving, principal consultant, Teradata Oil and Gas Team.

"This is the opposite of pretty much any other industry Teradata works in."

Many industries operate on much thinner margins than the oil and gas sector, but they still thought it was worth spending money on analytics, he said.

Mr Irving's goal is "trying to explain to the oil industry what this could do for them," he said.

Analytics systems should "become a more robust and significant part of the IT infrastructure in the upstream domain."

Oil companies are attaching sensors all over the platform which generate data for the life of the field, but "we are not getting maximum value from it," he said.

Many companies keep data siloed in different departments and domains, with very little data communication between them, and this makes it harder to implement new processes and workflows at scale, he said. "You have to understand the challenges in your own architecture," he said.

You could say that oil and gas companies have 3 types of data – transactional, technical and scientific.

Transactional data is stuff in the Enterprise Resource Planning (ERP) systems, SAP systems, operations and finance data. Technical data could include designs of casing shoes and well trajectories. Scientific data can include flow simulations and seismic data.

All of this data "comes in different flavours," he said.

Unconventionals and data

The North American unconventionals business has done much more with data.

For example, ConocoPhillips used analytics to work out the best way to reduce the number of shut-ins (when drilling needs to be stopped, for example due to high pressure gas entering the well).

They managed to reduce the number of shut-ins by 90 per cent, Mr Irving said.

ConocoPhillips is also using analytics to work out how to optimise maintenance on wells and tank emptying, he said.

It has improved its logistics, building on work done by a US parcel carrier, which worked out that (for example) it may be faster to do three right turns around the block than one left turn (the US drives on the right). They found certain routings led to less wear on the vehicles.

The company has been tackling questions like, what is the optimum well spacing (how many wells per mile) - and what is the best way to build the substations, roads and other infrastructure.

The company uses analytics as a continual guide to operations, he said. It brings together an integrated view of "what is the most effective way to develop my fields," keeping OPEX as low as possible.

The unconventional oil and gas business was basically a re-invention of the oil and gas industry, which meant an opportunity to bring in many new processes. The unconventionals business "looks a lot more like a factory than what we have offshore," he said.

Retail, manufacturing and refineries

Consider that Walmart has a supply chain so tightly integrated, that by the time you've loaded your shopping into your car, replacement items have been loaded onto a truck at the depot. "That's how integrated their supply chain is," he said.

Walmart has an integrated understanding of how to access the biggest 'wallet share' of a neighbourhood, with different prices, promotions and marketing. "They understand the environment in which they are operating."

It also sees its business as selling shelf space to suppliers, as much as it is about selling everything to consumers, and uses analytics to maximise what it can do with its shelf space.

Looking at car manufacturing, Daimler is doing 190,000 types of component failure analysis akin to 'decline curve analysis' work every night based on data from the production line, to work out if there is something which should be tweaked. "They understand the total cost and profitability of every piece of plant on the production line," he said.

Oil refineries are also getting good with analytics. At one refinery, the refinery managers have sat together with the traders to design a mutual dashboard, so the products being produced can be adjusted according to near real-time changes in the markets.

Sentient

Mr Irving uses the word 'sentient' to describe where he thinks oil and gas companies need to go.
"This is a bit of a hard concept", it basically means to have a better feeling about what is happening," he said.

This is a "new style of industry, you have organic sharing of data, you have organic sharing of experience," he said. "You have infrastructure which allows everyone to add the value they need to using tools they are familiar with."

If this was happening with offshore oil and gas, all the various technical domains should have much better insight on how their equipment is

running today, what it is contributing to the business bottom line, how it is operating together with other facilities, what should be developed next, what rewards are available, and does this link together with understanding of the subsurface.

People could quickly answer questions like, 'how to optimise the scheduling of maintenance tasks,' 'which bit of the reservoir to drill into next,' 'are we depressurising the reservoir too early.'

Operational areas

It gets much tougher implementing collaboration tools and analytics for operational areas of the oil and gas business, compared to strategic departments, he said. In operational areas, people are under constraints of cost and time, which make implementing software harder.

There is also more need to build bespoke software tools, because everybody works differently, and every team has a different mix of skill sets. For example, one company might want a specialist software tool for monitoring a reservoir using live data from permanent reservoir monitoring equipment, he said.

Discovery analytics

The "gateway" class of analytics is 'discovery', which basically means looking through the data for new insights that potentially could be put onto an operational footing.

As an example, consider that auction website eBay has a large staff of data scientists continually probing its live database to try to find patterns. About 60 per cent of the workload on its master database is from internal data scientists, he said. As a result, they might discover that one user prefers to click on red buttons rather than green ones, and only show them red buttons from now on.

In a similar spirit, Teradata has given a data science project to a Petroleum geoscience MSc student at the University of Manchester, to try to find overlooked stratigraphic relationships by doing analytics on a large amount of wells data, he said. This discovered badly interpreted facies and unseen hot shales, both leading to a re-appraisal of the entire basin.

Enabling data management

Teradata sees its role as 'enabling data management' – or helping the people who get very close to the data to help the company do more.

Many of the people employed by data managers are highly qualified, with PhDs in geology or data physics. "They got into data management because they were the ones who cared the most," he said. "Once you get tarnished with that brush it is very hard to get away from it."

"But it is a waste of talent, having someone that clever who is responsible for knowing it's on this or that file system, instead of enabling value to be extracted with the data."

"That person has to make sure all the metadata and master data. Someone has to care enough to do that and be knowledgeable about it."

The 'big data' label is not very helpful, he said. "To me, big data is anything where you take in data too quickly for your systems and processes to deal with. If your systems are Kingdom suite and a load of spreadsheets to run a brown field - you've probably got a big data problem. If you need to extract value from SCADA in your historians, and SAS analyses on your SAP logistics reports across a regions assets, then that's definitely a big data problem."

Looking at subsurface data, managing 2D alone can be a 'very difficult computational problem," when you get to 3D or 4D (with time) it gets difficult.

You have to find a way to make this data available for the life of the field, not just lock it away in your favourite software – and you have to manage security and safety.

SQL

Usually the best language for analytics is SQL, because that is the language which business people's systems use.
"If you want to show the CFO something - that has to be something he understands – ideally a few numbers (small data) and a graph. That's probably the thing he's already got - and it's probably powered by SQL."
IT staff in different domains speak different languages. IT staff serving the business tend to use Structured Query Language (SQL) for interrogating databases. Engineers like languages like Matlab, and some scientific people do other languages. "I was talking to seismic people yesterday, they kept saying 'we do this in FORTRAN," he said.

The challenge is to pull all of these IT domains together under one umbrella for the CFO's integrated "widget". It is data-driven analytics which enable these new kinds of transformation insight and as other industries have seen, complement (rather than replace) the experience of the decision makers who have access to such large amounts of data and computational power.

Download Duncan's slides at
http://www.digitalenergyjournal.com/event/e66da.aspx

Basin re-appraisal in New Zealand

The MSc project at the University of Manchester was designed to assess the applicability of standard signal processing functions to well logs. 2500 logs from over 150 wells in New Zealand's Taranaki basin were loaded into a Teradata Aster database along with their interpreted formation logs.

The project started by taking well logs from a 'few hundred' wells in the basin, putting them together, and 'cleansing' the data (removing obviously erroneous data).

It also did some manual work to simplify the text descriptions of the logs, reducing the 800+ words used to describe the formations and the facies to 92 'official words'. By simple data modelling, the data could be analysed by well, by depth, or by formation, to get a better understanding of the basin.

"Symbolic aggregate approximation" or SAX, more usually used for speech recognition was used to split data up into various bins based on characteristics. This was then used to identify 29 possible 'hot shales' (in a few seconds) that had been overlooked in the reports, Dr Irving said.

The next task was more subtle, to try to see if it was possible to tell the difference between "sandstones and mudstones interbedded" and "sandstones and siltstones interbedded".

Here, "you're doing some pattern recognition which is a lot more subtle across 4 logs at the same time," he said.

This requires a lot more parallel computer processing, saying "go and find the things here which look like this," he said.

The computer matched a lot of patterns – so then the next question is whether the geological stories behind them fit. On further investigation, it was clear that formations had been mis-assigned by performing the "spot the difference" analyses.

A lot of insight and experience was gained from a simple six-week study for a fantastic MSc project.

EnginSoft – quality checking your reservoir models

Having a centralised platform for data management can be very helpful for reservoir engineers to do quality checks of reservoir simulation models and perform analytical analysis, said Oludare Elebiju of EnginSoft

"If you have a single platform where you analyse post simulation [reservoir] models, and integrate all your data (reservoir, wells, pressures and rates), you could probably save a lot of time," said Oludare Elebiju, consultant reservoir engineer with EnginSoft.

"You would be in a better position to make timely decision," he said, speaking at the Digital Energy Journal Sept 29 Aberdeen conference, "Using Analytics to Improve Production."

With a central data repository, it is easy to create workflows that allow for various tasks to be performed without compromising the quality of the actual data, he said.

This approach operates within a single environment integrating numerical and analytical analysis and comparing the results, for example numerical vs. analytical production forecasting.

A centralised system also helps to reduce the amount of time spent on quality control of the same data.

This will enable several tasks to be performed by different engineers if the data quality has not been compromised, he said.

This will also reduce the amount of time reservoir engineers spend on data management pre and post simulation.

Typically, if a reservoir engineer has two weeks to do a job, which requires obtaining data from different sources and applications, it might take a great deal of time in evaluating the quality of the data (QA/QC).

If about 50-60 per cent of the total time is spent on data quality check and control, then the engineer might not have sufficient time to carry out the 'real' job, he said.

The reservoir engineer is expected to carry out designated tasks and make recommendations based on results achieved. The quality of the result can be directly matched to the quality of data the engineer has to work with.

If the quality of data is poor and sufficient time is not invested in QA/QC before embarking on specific tasks (reservoir modelling/simulation, history matching and forecasting), then results and standards are easily flawed.

So a tool that provides an efficient platform to perform effective reservoir data and model QC/QA will contribute a significant value in optimising processes, reducing data QA/QC time and maximising simulation, interpretation and reporting time, he said.

EnginSoft provides Computer-Aided Engineering (CAE) and intelligent Digital Prototyping (iDP) tools, as well as process simulation and design chain optimisation.

EnginSoft is distributors of 'Kraken', a reservoir data manipulation and integration platform, which can be used as a central repository for all reservoir data, and used to support structured workflows.

The software is developed by ESSS, a South American engineering simulation solutions company, and was originally developed for a large well-known Brazilian oil and gas company.

Data accuracy

Managing reservoir data centrally will also make it easier to ensure accuracy. It is common for oil companies to manage production data using spreadsheets only, and then pass the spreadsheets onto the reservoir engineers, he said

"For example, you might be working on an asset where you receive production data from the field (weekly/monthly) after allocations are done. It is possible to spot inconsistent trends in the data (well rates, pressures, well potential, etc.) which are mostly due to allocation errors. Such errors can be minor or significant and may require time to correct.

Decision making

Kraken can make it easier for reservoir engineers to understand reservoir performance. "You want to know, how I am doing in terms of production, injection, over time."

For example, "you want to see your production by well, block, field. You want to see the water oil ratios by well, by block, by field."

Any decisions, for example about maintenance, water flooding and EOR, can be made using the full range of available reservoir data.

Kraken can also support structured workflows and better multidisciplinary collaboration.

Optimising

Kraken can help engineers create customised process templates that can easily be documented and reused from time to time for implementing different process workflows. This helps to optimise the processes to ensure that the same project is done much more quickly and efficiently, enabling better and timely decision making.

Companies have different approaches to reservoir data analytics, architecture and integration to specific reservoir/petroleum engineering workflows. It is important to critically evaluate the integration process to ensure that resource time is optimally utilised during project execution so that cost is reduced and value is maximised, Mr Elebiju said.

Watch Oludare's talk on video and download slides at **http://www.digitalenergyjournal.com/video/1621.aspx**

Data Lab – letting academia work on your data problems

Data Lab is a Scottish government funded body which will help connect academic data experts with industry's data problems

The Scottish Funding Council, a Scottish body which promotes higher education, has set up "The Data Lab", an organisation to connect academic data scientists with the oil and gas and financial industries, solving industry problems.

Data Lab is based and administered from the University of Edinburgh, but it has an office in Aberdeen, based at Robert Gordon University (RGU). It works together with Scottish Enterprise.

There is a similar organisation serving healthcare, called the Digital Health Institute, also funded by the Scottish Funding Council.

Data Lab welcomes data challenges from both the 'private and public sector,' he said Duncan Hart, business development executive with the Data Lab, based in Aberdeen.

"We try to take a problem and go out to universities and say how can you, with academic partners, come up with an innovative solution that will make a difference," he said. "We're using the power of the academic minds to create models and create algorithms."

As an example, Data Lab connected oil major REPSOL with a team at the University of Glasgow.

"We can be involved in medium scale and large scale collaborative projects," he said. "The funding is dependent on the project."

The projects are usually short term, not four or five years, which is typical for academic research projects. "We're looking at real world results that can deliver real world value," he said.

A further aim is to develop data science capability in Scotland, and also develop technology which Scotland can export, he said.

"Open innovation" is a key philosophy behind Data Lab. "No company can afford to develop things on their own anymore, it's an impossibility," he said.

"Oil and gas companies want to maximise uptime and minimise downtime. If data analytics can help improve production by 6-12 per cent, there's a lot of people who will be very happy."

"If you can take 1 per cent, 2 per cent off your production cost, that's a significant saving. If you can take two weeks out of your shutdown because of a decision that is around data analytics, that is a lot of saving."

Data science can also make it easier for people to access the right data, and data which is verified as correct.

Value

Data Lab can also help work out the value of a data project. "We can help you scope the idea, work out the end result. That's better than trying to rush headlong into a data science project," he said.

Data projects can go wrong if you ask the wrong questions, select the wrong users, or have disagreements, he said. They can also go wrong if you have data silos, like engineering departments not talking to reservoir staff.

"There can be management resistance. Do management understand what they are trying to do? If nothing happens at the top that affects the bottom."

"There's a lot of academics who live and breathe this.

Download Duncan's slides at **http://www.digitalenergyjournal.com/event/e66da.aspx**

Halliburton – data, models, workflow and change management

To get a production improvement system working requires a mix of data, models, workflow and change management. Sergio Sama Rubio, Industry Solutions Advisor with Halliburton, explained how to do it

The four key components of developing a production optimisation system are data, models, workflows and change management, said Sergio Sama Rubio, Industry Solutions Advisor with Halliburton.

"If we only take care of three of them it doesn't work."

The ultimate aim is 'best in class operational performance'," he said. In most cases, companies could see a one per cent improvement in production without additional capital investment.

If they could get a better understanding of the behaviour of the processing facility, so they could navigate the constraints better, then "we could be producing more."

Consider the US refining industry. Between 1990 and 2000, the overall capacity of refining stayed roughly constant, but the utilisation increased from 85 to 95 per cent.

"Refineries in the 90s got better and better at using existing installed capacity," he said. "I think it's fair to recognise that these guys managed to squeeze the last drop of capacity.

"There is a lot we can learn from refineries. Try to extract the lessons learned and apply the same lessons to our world."

Data

Starting with data, there are many different aspects of data to consider – the quantity of data, is it covering the right aspects, time dimension (for example data for a historian), space dimension (which part of the asset or fields does it relate to), is it the right type of data.

"There are significant savings in from making sure we really capturing the data that will help us act better," he said. This means "capturing only the data that is relevant for my decision making, not capturing every single pressure, temperate and flowrate."

We should ask, "Do I have the data, when I need it, in the time I have allocated?" he said.

Sometimes people in your organisations object to a way of working, saying 'you don't touch my data', he said. "This could be solved with clear guidelines, for example saying 'you can view my data but you cannot modify my data.'"

Data can be managed with a 'federated' system, with the applications processing the data working directly with the source data, or with an intermediate 'operational data store', which all of the data is copied to, and made available to the various applications from there.

Models and workflows

Workflows mean having a structured way of doing certain tasks which are commonly done, such as well integrity management, steam flood, artificial lift optimisation, well performance, regulatory production reporting.

Some workflows are more complex, such as field development planning and artificial lift planning.

These workflows are about understanding what has happened in the past or what is happening today, or what will happen in the future.

By developing a structured workflow, you can make sure work is done in a standardised way, and also encapsulate the knowledge of the company's top experts, including people who have left the company.

A workflow will say, for example, after gentleman A has done a certain thing it goes to gentleman B.

Workflow is sometimes more structured or formalised than others, For example it could be a system where you decide to send a document to a colleague to see if she has anything to add.

A good workflow provides "a natural division of labour, things that people do well and things computers do well," he said.

"Humans are good at strategy, designs and choices, objectives and decisions. Machines are good at repetitive tasks, running models, optimising, and training."

"Humans are able to see trends, see in a more creative manner. Computers will follow algorithms," he said.

To take an example from the use of computers in chess, "every chess player will agree that the combination of a human plus a chess computer program are absolutely unbeatable," he said. "It gives birth to a new discipline - advanced chess."

Change management

The final step is change management, getting to the point where people are comfortable and in the habit of using the systems. A failure here has caused the failure of many projects.

It is often helpful to do a 'proof of concept' first, demonstrating to people the value that the new system can provide, before starting to implement it, he said.

For example, you could build a workflow which is used on just 10 wells. If the business can see a gain from it, the scope can be extended.

"Build a business case to convince management that this system will be able to increase uptime by 3 per cent," he said.

When implementing workflows it might be easiest to start with regulatory compliance, because these are tasks that the company needs to do.

Or you can look at areas critical to continued operations. "You say, 'Mr CEO, do you want the company to keep operating? Then we need a well integrity system.' But do it in a way that it is the first step in a longer journey."

You might also want to continually revise your workflows. One Halliburton project has been through nine iterations of workflow since the first release in July 2008.

The systems need to be able to be used by people with a wide range of technical competence, he said. "We cannot expect that everybody in our company has a PhD in geology or petroleum engineering."

"We need to make these tools available for operators and engineers," he said. "They have different needs."

A common problem with change management is organisational fatigue. "Many companies launch initiatives, they say, 'we need to start with the data, we are going to do it in the house in a proper way.' By the time the three years have gone past, management has changed priorities."

"Some companies are notorious in that the G+G people, production people and surface people don't talk to each other," he said. "This is one of the bottlenecks in our industry. Don't let siloes get in the way.

Watch Sergios's talk on video and download slides at
http://www.digitalenergyjournal.com/video/1732.aspx

Jonathan Guthrie – how to get past "no"

Senior management in oil and gas companies often avoid interesting analytics projects because they are more comfortable doing things the way they always did them, said energy consultant Jonathan Guthrie

There is a lot of talk in Aberdeen about trying to be more efficient, but "to be honest, I'm not seeing a lot of new efficiencies being introduced," said energy consultant Jonathan Guthrie.

He was speaking at the Digital Energy Journal forum in Aberdeen on September 29 2015, "Using Analytics to Improve Production"

"I've been working in oil and gas since 1981, this is the sixth downturn I've seen, and behaviours have not changed. It is so disappointing. Every other industry gets better, but this one carries on, they batten down the hatches and carry on with the same old story and excuses."

In this climate senior management often just want to keep the company on a conservative course, saying no, killing ideas, and demanding onerous reporting through bureaucratic systems, he said. "There isn't anyone in charge of new growth ideas."

The mantra seems to be, "let's give the appearance we want to improve, but let's just continue the same old workflow, the same old inefficient processes we've always been doing, it feels safe."

Mr Guthrie has looked at data from many E&P companies in Aberdeen, and found that "one company is no better than another in how they collect, manage and analyse data."

As an example, Mr Guthrie recently worked out how he could help an operator deliver £15m of value to the business, which he could implement with a few weeks of consulting work. But the operator's procurement staff insisted that company rules were that all consultants should cut their rates by 10 per cent.

"I said, 'no, why should I,'" Mr Guthrie said. "I had already offered them my lowest rate. Why should I as a small independent take a cut for a short-term service engagement just because everybody else is? They were only thinking of cost and were blind to value."

So as a piece of advice to the industry, "if you want to get analytics going, you have to avoid these people, you have to find the person with the vision and enthusiasm to change behaviours and do something different," he said.

Meanwhile most data is just treated like TV, the data comes in and people look at it, it gets stored, but never analysed. It would be better if the data was analysed and the results used to work out ways to improve.

The talk about 'big data' is more hype, Mr Guthrie said. E&P companies have always spent large amounts of money gathering data, the point is that they do nothing with it.

Instead of just talking about optimising 'investment dollars per BOE of production,' companies should be asking broader questions, such as, 'where is the best place to drill a new well,' or 'are you using the best completion technology,' he said.

"A lot of work we do is showing people what they don't know they don't know, or tell them about things that aren't happening, which they thought were happening," he said.

Operators still waste large amounts time and effort requiring highly skilled engineers to spend their time 'QCing' data, or extracting and crunching data in spreadsheets. "How sad is that?" he asked.

Another common problem is that people only focus on 'their own' data from a small segment of operations. You arrive at a situation where 'their' data says everything is fine, but the plant/equipment is still failing.

Start small with analytics

On the software side, you can start small, taking data from different systems, mash it together in an analytic tool, quickly visualise what is going on, get a better understanding of the flows and look for actionable insights.

"Data is locked in our applications, experience and knowledge are locked in the mind of our employees, analytics is the key to unlocking the value here" he said.

Emotions

Data attracts a lot of odd emotions.

"Many people despair that there's too much data, and it is of poor quality and it needs to be fixed before it can be used. The first step is to just look at a small piece of it. You can't eat the whole elephant at once."

There is a lot of apathy around data. People say, "I've collected all this data and nobody ever looks at it, why should I bother," he said.

There is also fear, with people worried about stating ownership of their data, in case they get blamed if someone else finds an error in it.

Another emotion is control, where the data owner declares a right to tell others how the data should be used and who is allowed to access it. "These are the barriers that need to be broken down," he said.

IT department

The IT department can prove a barrier to analytics. "They have security, they have policies, they will decide how data will be stored," he said.

They want to provide software in the traditional way, 'Give me a spec, tell me what you need and I'll deliver it to you,' he said.

But the business user doesn't usually know what they need, to be proactive they need unrestricted access to the data and self-service tools to explore data of all types, to discover insights and deliver actions.

History and now

The real challenge for oil and gas experts is to use historical data together with the streaming data about what is happening right now.

There are analytics tools which work through historical data and real time data together to make predictions, he said.

For example the analytics can say, if event 'A', 'B' and 'C' happen, then there's a failure on its way.

The computer can automatically analyse the incoming data stream, and see A and B have happened and C is close to happening and raise the alarm.

The computer system can also automatically help you check you have the right spares available, how much unplanned downtime you have, what are the real-time trends and how this is impacting profitability.

How to use Analytics to improve Production

Tools

For analysis, Mr Guthrie has used Tableau, Qlik and TIBCO Spotfire (his analytic tool of choice, he was previously employed by Spotfire).

Tools like this can work simultaneously on data from multiple sources, without having to bring the data into a central warehouse, he said.

If you want to do modelling on the data, then it is easier if the data is in one place, but "you don't have to start there," he said.

When optimising, you want to get as big a picture as you can of the process.

"The great thing about analytics is, it helps people very quickly visualise what is happening over time," he said. "You can drill and complete better wells, optimise processes and routes. We're constantly searching for what we don't know we don't know."

As an example, there is discussion going on about taking old seismic shoot data and re-processing it using new techniques.

Looking at Spotfire in particular, most oil companies have corporate licenses, which means that any company employee can use it. "For an engineer typically you just have to get a copy on your desktop to connect to the data and start analysing."

Oilfield services companies could use analytics for root cause analysis, drilling and completion optimisation, analysis of revenue and profitability across different products and regions, HSE incident tracking, maintenance schedule optimisation and project management, he said.

Wood McKenzie currently delivers a tool to its customers using Spotfire to do decline curve analysis on the production data history from more than 1 million wells in North America, he said.

Out of the box Spotfire is a great tool both for quickly building simple dashboards, and for doing complex data science, he said.

Middle East

Mr Guthrie was engaged over summer 2015 working for a Middle East oil company, where he used Spotfire to help implement new analytic workflows, to monitor and analyse how allocated production from 2,500 wells was declining, the effects on the gathering centres and wells at risk.

Spotfire was also used to optimise rig and workover activities.

"By delivering visibility of rig resources and workover activities with Spotfire the team were able to accelerate the delivery of 120,000 bopd of gain across all assets in 6 weeks just by prioritising and optimising the activities and resources," he said.

The business environment for these companies is quickly changing, as fields start to decline and water management becomes a larger factor, they need to analyse more and more data to be proactive in the decisions they are making for the future life of the reservoirs, fields and the assets to deliver the production.

Case study

As one example, the company is combining data from spreadsheets, files, Halliburton's "OpenWorks' and Schlumberger's "Finder" data management tool to build new workflows to support the decision making processes.

Spotfire acts as an 'integration layer', which is "nothing clever", just bringing data into the analysis from a number of underlying data sources/views, he said.

In 'Eagle Ford' multiple data sources provide the feed into a Teradata data warehouse, which does the data governance work, and then the advanced analytics is delivered using Spotfire.

The company does a wide range of analytics including predicting failures, optimisation, looking at well settings, recommending actions, electrical submersible pump monitoring.

Another customer is looking at Spotfire data to monitor and analyse Electrical Submersible Pump (ESP) failures and compare suppliers, he said.

"This is where I see the biggest value add, analytics is going to help identify the right technologies, the right tools for the job, and show what works what doesn't," he said.

So analytics should help you get to first oil faster, improve your production capability and be more efficient, he said.

Watch Jonathan's talk on video and download slides at **http://www.digitalenergyjournal.com/video/1713.aspx**

List of attendees 'How to use Analytics to improve Production' Aberdeen, Sept 29, 2015

Graeme Coghill, Managing Director, Aberdeen Group Ltd

Steve Eacott, Industry Solutions Lead, Accenture

Scott Petrie, Director & Principal Technology Consultant, Analysis Logic Ltd.

Ehud Reiter, CTO, Arria

Gatsbyd Forsyth, Uk Operate Sub/Surf & PO Mng, BG Group

Dan Kuszpit, Principal Consultant, Carlton Resource Solutions

Oludare Elebiju, Consultant Reservoir Engineer, Enginsoft

Stephen Turner, Sales Manager, Enginsoft

Vinicius Girardi Silva, Business Development Manager, ESSS

Avinga Pallangyo, Finance Admin, Finding Petroleum

Jonathan Guthrie, GreyCloud Limited - Analytics for Energy

Sergio Sama Rubio, Industry Solutions Advisor, Halliburton

Mike Scott, Senior Managing Consultant, Intelligent Operations, Halliburton

Gavin Robinson, Business Development Manager, Landmark

Alexander Petrie, Director, Left Field Associates Scotland Ltd

Azuka Akeze, Reservoir Engineer, Maersk Oil

Cindy Wood, Senior Consultant, New Digital Business

Steven Taylor, Production Reporting Analyst, Nexen Petroleum (UK) Ltd

Nick Pashley, Business Applications Analyst, Nexen Petroleum (UK) Ltd

Chris May, Systems Director, Oceaneering

Tom Fox, Director, 1234most

Kurt Prendergast, General Manager, Palantir Solutions

Deborah Murison, Production Technical Sales, Schlumberger

Steve Harrison, project manager, Scottish Enterprise

Fiona McDonald, Account Manager, Scottish Enterprise

Vivek Jaiswal, Reservoir Engineer, Senergy Energy

Peter Brownsmith, Business Development Lead, Tata Consultancy Services Ltd

Duncan Irving, Oil and Gas Practice Lead (EMEA/APJ), Teradata

Duncan Hart, Business Developement, The Data LAb

John Greenhough, Research Associate, University of Edinburgh

Wim der Kinderen, Consultant, Well Optimation Ltd

Anagha Vellani, Business Analyst, Wipro UK Limited

What did you enjoy most about the event?

The honesty of the talks with regard to the difficulties of implementing up-to-date analytics techniques & associated systems
John Greenhough, U of Edinburgh

Breadth of expertise and knowledge at the event. Great networking. Great value for money
Alexander Petrie, Director, Left Field Associates Scotland Ltd

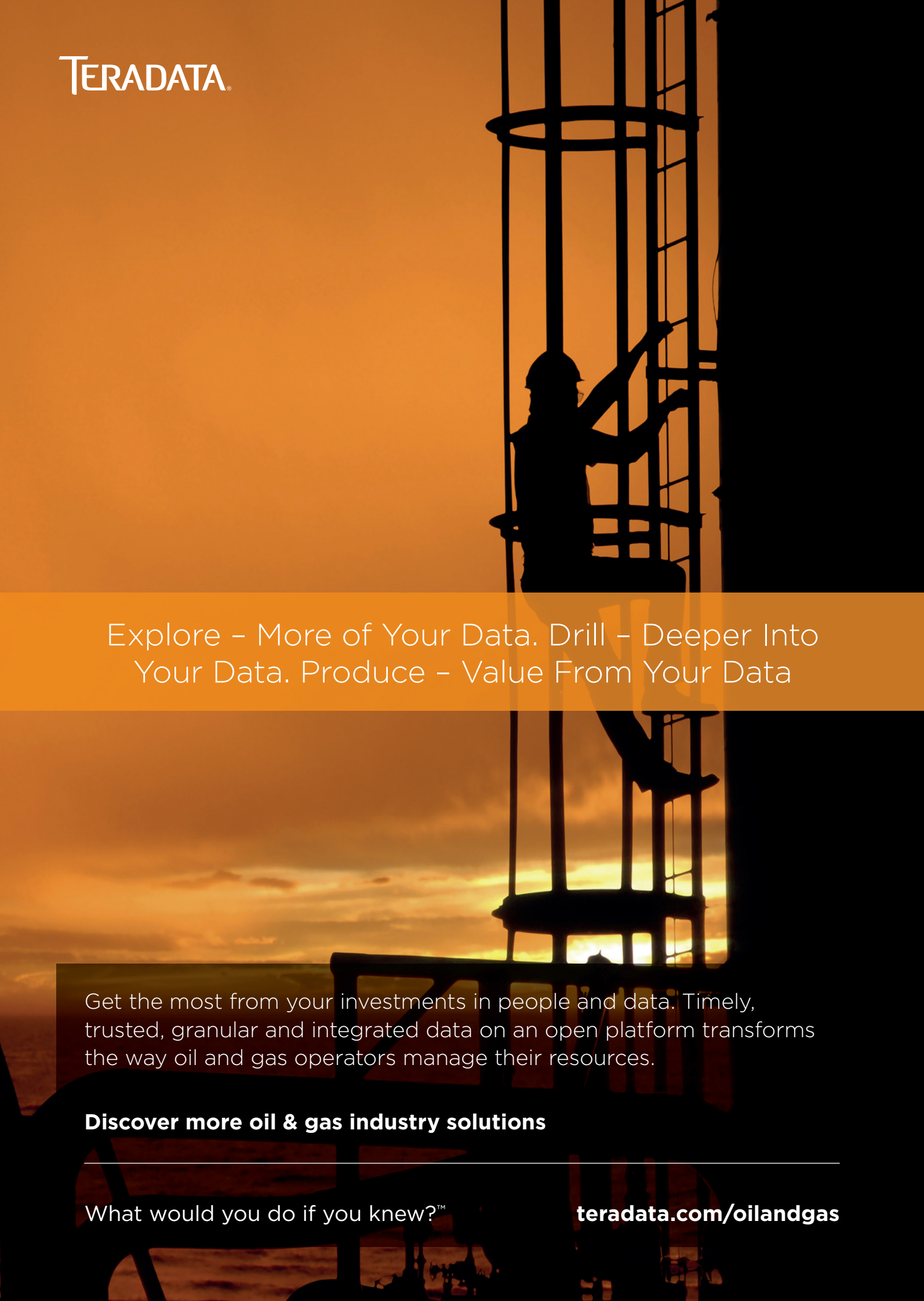
Learning experiences of other companies. Understanding what does, and (more importantly) what does not, work in practice

Interesting discussions with other participants

The general presentation quality was good, and the vendors did well in providing educational material which wasn't solely about flogging products.

Great insights from a range of vendors and oil companies.

A morning of presentations + lunch is an efficient format for learning and networking.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