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Reducing resistance to change in introducing new IM technology

August / September 2015 Issue 56

Maana: Chevron and ConocoPhillips invest in a new data search technology

Finding Petroleum

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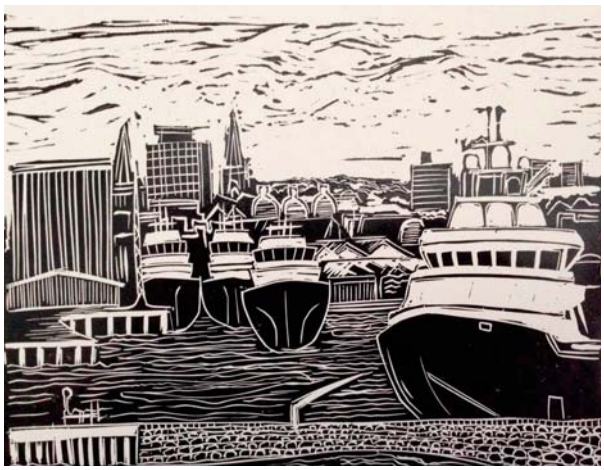

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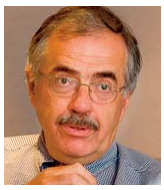
Digital Energy Journal shares expertise about how to get more value from digital technology in the upstream oil and gas industry

Subsurface software needs to get more sophisticated

by David Bamford



At their respective Annual General Meetings, BP and Premier Oil showed an interesting graphic summarising 4 oil price "train wrecks".

The first was 1986-1987, the second 1998-1999, the third 2008-2009 and the fourth this one, all of the first three featuring in my memory bank!

Two facts struck me based on this graphic.

Firstly, prices could recover in 12 months or it could be 48; secondly, at this point in the cycle there is no way to tell which of these recovery times will apply (except that we are now 12 months into this 'wreck').

This is important because

1) A short recovery time implies that "slash and burn" – firing people and cutting Capex – might suffice

2) A long recovery time means that behaviours have to change, as they did as a result of the 1986-1987 downturn for example.

Personally I am in the "lower for longer" camp.

If you look at the recent financial reports from for example PGS, TGS, Polarcus, Fugro, it is clear that their customers are heavily into (1) above. This is putting major downward pressures on revenues from proprietary 3D towed streamer acquisition, with multi-client seismic holding up a little better.

But if (2) applies, then as a next step, behaviours have to change so that our industry works at $60/barrel. And gets back to undertaking exploration and reservoir management with confidence.

I (hope I) have made it pretty clear that I think this means – and I predict - that the era of proprietary towed steamer 3D seismic is coming to an end as explorers go for the earlier, less expensive option of buying multi-client towed streamer 3D before they have acquired the target acreage and then shooting proprietary 3D with seabed cables or, much more likely, seabed nodes when they have actually acquired the acreage.

Oh, and integrating other geophysical data too. For example gravity, magnetics, electro-magnetics, passive seismic.

The exact combination of geophysical methodologies will vary with the problem; for example, if geoscientists were working on a fractured basement play in the West of Shetlands, then their database might consist of a conventional, but multi-client, 3D seismic survey, P and S data from a proprietary seabed nodes survey, and Full Tensor Gravimetry (FTG).

Work on a sub-salt problem would involve a different suite of geophysical measurements, attention to the multi-azimuth opportunities afforded by seabed nodes for example.

What this 'multi-measurement' implies for interpretation software providers is that they need to move away from their current "inexpensive business lunch" propositions.

You know what I mean. There's only one starter you like, the three main courses all involve chicken, and the deserts are lychees or ice-cream!

They need to offer a truly "à la Carte" approach. I have yet to see one!

David Bamford is a director of Digital Energy Journal and Finding Petroleum, and a non-executive director of Premier Oil.

Maana - a new and better way to search big data

Technology company Maana is aiming to make it easier to search oil and gas big data – and has over $14m funding from Chevron, ConocoPhillips, Intel and GE.

Technology company Maana, based in Palo Alto, California, has developed a big data search engine to make it much easier for oil and gas companies to search and analyse their data.

The company has over $14m funding from Chevron, ConocoPhillips, Intel and GE. Also investing is Frost Data Capital, an incubator / venture capital firm.

Some of the investors have already tested the Maana search engine using their own enterprise big data with their own subject matter experts.

Jeff Dalgliesh, formerly with Chevron, joined Maana in 2014 as its leader for oil and gas "search enabled solutions."

At Chevron, Mr Dalgliesh led information management globally for drilling and completions. Before that he was Chevron Global Drilling Information Technology Architect (2005-07).

Maana was founded by CEO Babur Ozden and CTO Donald Thompson. Mr Ozden, a serial technology entrepreneur, has had two companies acquired by Fortune 500 corporations. Mr Thompson was previously at Microsoft, where he founded Bing's Knowledge and Reasoning Team (project Satori), and co-founded Microsoft's project Arena, which ships as the SQL Server Semantic Engine.

Perhaps a simple way to explain Maana is that it automatically helps to work out the structure of whatever data set it can see, enabling it to come up with conclusions that would be hard or impossible to do manually.

This can be used by subject matter experts, who aren't necessarily data scientists, to find answers to their questions based on the company's datasets.

Maana's search engine crawls, mines, analyses, classifies, clusters, connects and correlates the data, using statistics and machine learning.

Maana can mine datasets with varying degrees of structure or lack of it thereof. For example with structured data, Maana can work out which columns have correlations with which columns, and what might be telling the user something useful.

Maana also adds in additional structure that does not exist in the data sources it crawls. For example, even if information about wells is not explicitly tagged, whether it is about 'conventional' or 'unconventional' wells, Maana could work this out from patterns in the data and make the tagging itself.

Maana mines unstructured data (like the content of a document), radically different than traditional search engines. Instead of indexing terms in the documents to retrieve and return documents as search results Maana uses the content of the document to further enrich the entities and their relations Maana forms in its Semantic Knowledge Graph.

For example, in one test, the system automatically worked out which data related to peoples' names by spotting patterns in how often certain letters appeared, and realising that the patterns for the 'first name' field were similar to the 'surname' field.

In fact, Maana could make many industry efforts to standardise oil and gas data structures redundant, if it can automatically put in its own structure to any data set.

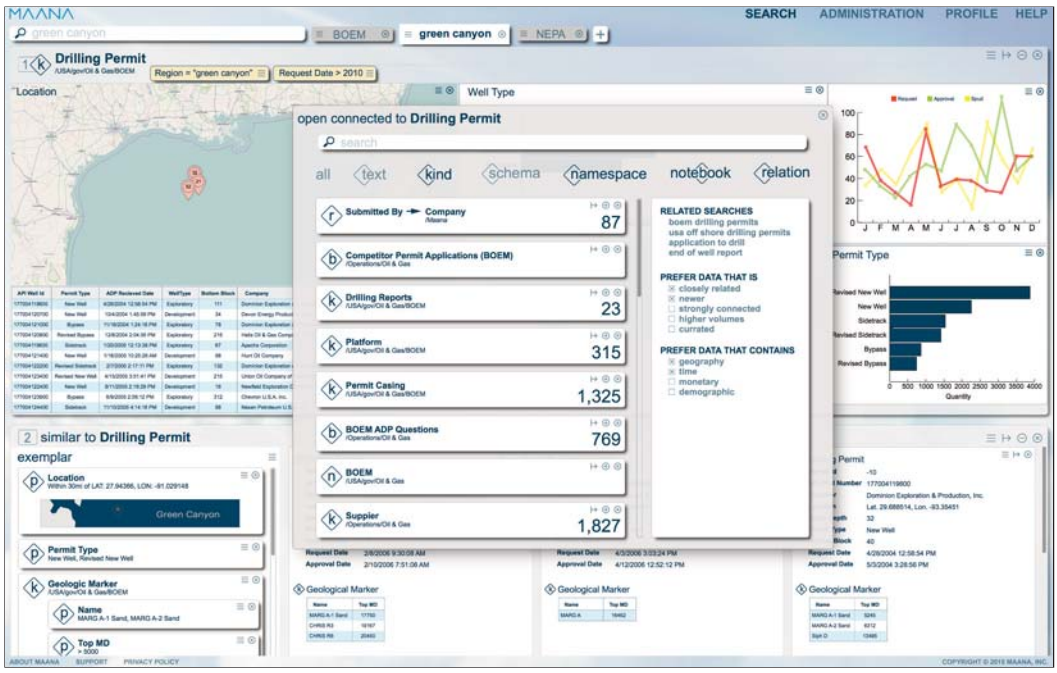
Being able to work with unstructured data in this unique way means that the software can

Jeff Dalgliesh, leader of oil and gas search enabled solutions with Maana, previously Chevron's global information management leader for drilling and completions

spot patterns in the written comments made by drillers, as well as the actual drilling data. It might spot for example that drilling problems are often encountered at a certain depth.

Many companies use different terminology and codes for drilling problems, which can be a nightmare for a human to interpret, but can be very easy for a computer which is just looking for patterns, Mr Dalgliesh says.

In one example, Maana was looking at a set of data about well completions, and it could group together all of the elements connected to financial costs, and all of the elements connected to physics.



Using Maana to search past drilling permit applications, which might be similar to the one you are submitting at the moment.

By being able to run through any data set in the company, Maana can help people from one company domain (such as accountants) make sense out of the data from a discipline they don't usually work with (such as production engineers).

The Maana search engine is not designed to replace a subject matter expert. On the contrary, using the subject matter expert, data and algorithms together "makes for a very powerful combination", Mr Thompson says. The jargon is "user guided machine assisted".

All of this leads to something of a redefinition of what 'search' means. It is not about Google-style searching for specific text or phrases in the document, but understanding the information and knowledge potential of the data sources when they are joined together.

Solving problems

The software could prove most useful spotting patterns and sharing knowledge to solve problems, Mr Dalgliesh says.

Most drilling problems come down to physics and rock properties, such as drilling bits getting stuck. And different parts of the world have the same physics and similar rock, yet they don't share information very much, Mr Dalgliesh says.

The software could help someone answer questions like "find me data for when our company had a similar problem to this, drilling in a similar geology to this, and what the company did about the problem."

It should mean that the more data a company has, the more competitive they are, he said. The data becomes "a strategic competitive asset."

If you were getting ready to plan a well, you could use the system to find data about other similar wells, and how the drilling went, and how they produced.

You might notice (for example) that most of the permit requests for this sort of well had to be submitted several times. You can use this information to revise your expected timescales or make sure you get your permit right the first time.

You could work out which decisions made by the drilling department had the biggest impact on production a decade later, which completion techniques yield the fewest production failures, which rigs are the most efficient, which suppliers are the best, where is the best place to do well workovers, and how efficiencies can be found.

The software can be used for predictive analytics – for example one power turbine can generate 15 tb of sensor data a year, which can be used to do predictive analytics.

It could be used in maintenance. If a field technician needs to repair a certain item, Maana can list some of the problems which all those items have had before, and which parts were needed to fix them, so the technician can be make sure she has those parts in her bag.

Platform tools

The software could also be used as a 'platform' tool for other smaller companies to build a product with.

For example, a drilling engineer could use the tool to write a 'classifier' for kick detection – a tool which would scan various real time drilling data and spot patterns indicating that a kick was happening or about to happen.

Afterwards you could analyse all the kicks which a company had during the year, what was happening before they occurred.

You could look factors such as whether a certain superintendent was on duty when many of them happened.

As another example, you might need to make a difficult decision about whether a certain well is safe for running (vertically suspended) wireline tools, because you are not sure of the gradient of the well (or if the data you have about the gradient is correct). A tool could be written to assess all the available data and make a best estimate.

There are 'APIs' (application programming interfaces) which allow software tools to be built on Maana.

You can link together different searches in sequence, for example one step to determine if a certain image is a photograph or a drawing, if it's a photograph have a follow-up step to see if it is a face, if it is a face have a follow-up step to try to recognise the face.

Technology

The underlying database infrastructure that holds the knowledge structure (the Emergent Semantic Graph and Liquid Indices of Maana) is stored in Apache Accumulo, originally developed by the US National Security Agency and now developed by the non-profit Apache Software Foundation.

It also uses the Apache Spark engine for large scale data processing, part of Hadoop "ecosystem" of software tools.

Most customers will probably want to run Maana search as a 'private cloud' service, running within company data centres, rather than on the cloud, Mr Thompson says.

If a company already has its data in a Hadoop data storage, Maana can get to work on it straight away. It is fairly easy to connect to databases for software tools such as Salesforce and SAP, and other relational databases and log files.

For streaming data, you can set the interval of how often you want Maana to add new data, for example hourly or every 10 minutes, or second by second.

This sort of search can also be done automatically, once the data is available, on whatever databases people already have – which could prove a simpler way of doing it rather than trying to fit all corporate data into a single data system.

Other industries

Altogether Maana is focussing on the "Fortune 500 market" (very large companies), including in oil and gas, manufacturing, healthcare and insurance.

For example in healthcare it has been used to find patterns in patient data, for example to 'find me a patient like this patient', Mr Thompson says.

Large companies typically have thousands of separate data systems which are not integrated in any way, he says, and there is a demand for a 'horizontal view' about what is happening. "This is where the problem is most pressing," Mr Thompson says.

Some companies have their data in large databases with 1000 columns, with many different entity types in it – customers, parts, locations, engineers. To go through all of this manually would be nearly impossible.

Maana has also been used on cyber security projects, for example scanning corporate e-mails to try to detect phishing attacks, or patterns in how data is being moved to outside networks.

Maana has also been used on public data, including the US Bureau of Ocean Energy Management (BOEM) data. "We've done some very interesting projects," Mr Dalgliesh says.

The website is www.maana.io.

Private equity opportunities in oil and gas

We interviewed Chris Sim, director of investment banking at Investec, about where he sees the biggest opportunities for the private equity sector in the oil and gas industry.

The private equity sector (investment funds which buy ownership stakes in private companies) is increasingly making its presence felt in the oil and gas industry.

Larger private equity companies have recently made a number of investments into exploration and production companies in the North Sea, including Zennor Petroleum (backed by Kerogen Capital based in Hong Kong and London), Siccar Point Energy (owned by Blackstone and Blue Water Energy), and Neptune Oil and Gas, led by former Centrica CEO Sam Laidlaw, funded by The Carlyle Group and CVC Capital Partners.

In addition, some of the larger private equity companies who have invested in oilfield services include The Carlyle Group, KKR, Riverstone, and Blackstone, as well as specialists such as First Reserve, Blue Water Energy and Limerock. "There are also other 'mid-market' private equity funds in the UK who are also active in oil field services, such as LDC, Inflexion, and Phoenix Equity Partners," says Chris Sim, a director of investment banking at Investec, who has recently completed a number of oil and gas private equity transactions.

There are also private equity funds that specialise in earlier stage oil and gas technology investments. "Examples include Saudi Aramco Ventures, who are particularly interested in bringing new technology into Saudi Arabia," Mr Sim says.

Kentech / Bluewater

Investec recently acted as financial advisor and capital arranger for a $32m capital raising for oil and gas services company Kentech.

The investment was made by Blue Water Energy, a specialist private equity energy fund who typically look to make investments of $50m to $150m per company.

Kentech provides electrical, instrumentation, control and telecommunications (EICT) services for the oil and gas industry, employing over 3,000 people.

Headquartered in Ireland, Kentech has operations in Kazakhstan, Sakhalin Island, Australia, UAE, Qatar, Kuwait and Mexico and has worked in over 30 countries worldwide.

It services a blue chip client base consisting of a number of oil majors, as well as the international engineering, procurement and construction companies (EPC) such as Petrofac and Saipem.

Oilfield service companies

"Some private equity companies have seen some big successes in the oilfield service sector," he says, "so there is still a willingness to invest further."

It helps that the oilfield services sector often has more in common with conventional businesses than the exploration and production sector. "You might build things, sell things or rent things out," he says, "which generate revenues and cash flows which are easier to analyse. By comparison, private equity firms often view exploration and production investments as higher risk. You need a specialist background to fully understand the technicalities of geological risk," he said.

When considering an investment, investors tend to focus on past performance, the quality of the customer base, the market position, management track record, key growth drivers and the geopolitical exposures.

Styles

Private equity companies can have a range of investment priorities.

For example, for firms like Blue Water Energy, a key priority is a high quality management team with a proven track record of value creation, who maintain a meaningful stake in the business.

Private equity firms are often keen to build their reputations as good companies to work with, encouraging the managers of their existing portfolio companies to speak to the managers of prospective portfolio companies.

For these sorts of investors time horizons are typically 3 to 5, but can be as long as 10 years (meaning that the private equity company is planning to hold its investment for 10 years).

Many private equity firms will typically seek a controlling, majority stake in businesses. Although this can sometimes be met with caution by family businesses wary of losing control, target companies should balance this

Helping private equity invest in oil and gas - Chris Sim, director of investment banking with Investec

against investment firms' ability to bring much more to the table than just their capital, including industry contacts and expertise as well as significant experience in growing companies.

Some private equity companies make repeated investments with the same management team who will manage different businesses, often running a company, turning it around and selling it, before moving on to another company to repeat the strategy.

Private equity companies are in a very competitive world, and they need to consistently outperform their competitors in order to continue attracting funds. This means making good decisions and good investments, and finding the right experts to provide advice is essential.

But a good investment can quickly turn sour if (for example) a larger company in the sector with a market leading position and a strong balance sheet makes a strategic decision to go into direct competition with a recently acquired portfolio company.

With the current low oil price, there are likely to be many companies urgently in need of money, so good opportunities could shortly become available. "Now could be an incredibly good time to put good money to work," he said. "But there is still the risk it could be awful if you invest in the wrong parts of the sector, or the oil price continues to recede."

Reducing resistance to a change in IM technology

There are ways to reduce user resistance to the introduction of new information management technology, writes Gianluca Monachese, director business development, KADME AS and Vasily Borisov, director of technology, KADME AS

When an oil company, or a national petroleum agency, decides to finally undertake a project to change an information management system, there is a lot they can do to minimize the related risks.

- Do not involve only the people that were expert in the use of the old system, bring also fresh views into the picture.
- Communicate the reason of the change to everybody in the organisations who will be affected by it.
- During project execution, allow the vendor to talk directly with the end users.
- Allow time for a design phase, rather than asking the vendor to just install the solu tion you want in a few weeks.
- Continuously look for possible advantages the change will bring, even though you had not considered them in scope.
- Always prefer a phased approach. It is good for both the vendor and for you as it reduces risk and increases people buy-in. Consider that when preparing the budgets.
- With the new system in production, keep the project team in place to continually mitigate the internal resistance from the end users, helping them to focus on the original rationale behind the change.
- Work with the vendor on the training pro grams aimed at introducing end users to the new system, so that you can contribute to the explanations regarding any devia tions in the way data is presented.

Resistance to change

In business-to-business relationships there a lot of resistance to change. This is a natural effect of the fact that an organisation is not simply a group of individuals working together, it has its own capabilities, values and policies.

The organisation has to cope not only with the habits of the individuals but with the entire set of work procedures and consequent more complex change management processes. The demographics of the organization and the complexity of its structure are other factors.

Disruption is not seen as a positive word in a corporate environment.

Normally the customer prefers smaller, non-disruptive improvements of existing technologies already implemented.

In the oil and gas industry, organisations have a tendency to get stuck with the same information management systems for decades (corporate data management solutions, National Data Repositories). This is not because they are particularly good, but because of the factors mentioned above.

This means that technologies are mostly changed because of external factors, for example when a technology is no longer supported by its vendor.

Daft technical requirements

Consider an organization which has decided to change their information management system because the software they have been using for the last 20 years is not supported anymore.

They produce a Request for Proposal (RFP), trying to describe what they want.

At this stage the focus is too often on technical, rather than business requirements. This can be because the RFP is put together by the IT department, and there is a gap in the internal communication regarding what the end users of the system actually need.

This might also be because the RFP is put together by a reference group that represents the most experienced end users of the old system, who have been doing their work in the same way for many years.

In both cases, there is often the introduction of mandatory technical requirements that immediately create obstacles to the introduction of new technologies.

Here are a few real examples of special requests from RFPs:

- “PPDM 3.8 data model or later with Gold compliant is a mandatory requirement” [exact statement, including wrong grammar]
- “The system runs on Oracle as database”
- “It should also be possible to merge results and compare data, and a table view, row view and chart view of the data must be provided”

Gianluca Monachese, Director Business Development, KADME AS

None of these examples actually say anything about what the end user wants to achieve and end up creating unnecessary complications for both the customer and the vendors that are responding to the RFP.

The effect is in fact uncertainty on the actual scope of work and a consequent increase of the risk factor that the vendors are applying when suggesting their solutions to the customer.

How vendors cope

To minimize this risk and stand a chance to win the tender, vendors are forced to do some of the following.

- Find a partner that they were not really looking for, just because they have a required certification, to try and reach a hybrid solution integrating different technologies.
- Bend the technology they strongly believe in, and in which they have invested many years in R&D, to cope with the technical requirement.
- Increase the price, to cope with the risk presented by a non-clear technical require ment that might add considerable amount of work to the scope.

Of course the organization does this in good faith, in an attempt to reduce negative change.

But the customer will most likely end up with a system that is regarded by the end users as not as good as the previous one, while the vendor will have developed a heavily cus-

tomized, less supportable solution that deviates from the product they had developed on the basis of their technology and market research.

Bring fresh ideas from the users

We suggest that the organization writing the requirements for the new system should not rely exclusively on the opinions of the people who have built and used the old system.

Yes they have a lot of experience. Yes they might be enthusiastic about the change.

But consciously or unconsciously, they would end up with a description of the same system that they have at the moment.

New people should be involved, including from outside the organization (consultants).

Deployment

Typically the customer is requesting a very short deployment time, and requirements are vague.

The vendor puts together a project team and its software engineers start sweating.

The design phase is too often overlooked by organizations when they put together an RFP, because they believe that the ideal solution is already out there waiting to be installed, maybe with a couple of weeks for customisation.

This misconception, with little or no time given to the design phase, is the single biggest cause of project delays and overruns.

It is imperative for the software company system analysts to communicate directly with the end users (but this is rarely allowed by the project team at the customer). This way they can do some good design before starting customization of the software in the wrong direction.

It is also at this stage that it becomes evident how a disruptive change would eventually bring additional benefits to the organization, apart from those considered at first.

If you are lucky to have selected a very creative and flexible vendor, and prepared to process a few Change Requests with additional cost, your project can give you a lot more value than you had originally expected.

Post deployment

The point of completion of the software implementation is the point when all users gain access to the new system, and most of the psychological reactions start to unravel.

Any change in the previous workflows, even if explicitly requested in the RFP, meets a lot of resistance.

If the new system is better than the old one, then it will also be better at showing the underlying data errors.

It is usually the same people that are looking at the new system now who made those data management errors.

Users are reacting by default, blaming bugs in the new system, because they do not see exactly what they were seeing earlier.

The status quo of many years past is disturbed and the users are out of their comfort zone. It is up to the vendor to defend why the information is presented in the way it is, and to demonstrate that any inconsistencies are not due to the new system. So the new vendor can easily end up with no friends among the operational staff.

The vendor needs to try and soften up the issues when communicating with the users.

Often, the organization leaves the vendor at the mercy of the flow of critics from the end users.

The project team on the customer side is quickly disbanded and the vendor is left to "support" end users that were probably not properly involved in the early stages of the project and that were not sufficiently informed about the rationale behind the change.

"Training courses" quickly turn into discussions on why the system does things in this way rather than another, with questions coming from people that were not even aware of the requirements formulated by their colleagues in the original RFP.

The project owner, on the customer side, can help minimize the resistance from the end users also at this stage.

Case study

A modern International Oil Company with a significant exploration focus needed a new information management system, because the vendor of its existing system was dropping support for the software.

The IOC had a very clear and structured data management policy. It had a Data Bank department with 7-8 people loading data into a corporate data management system from a well-known supplier, heavily customized to meet the business needs.
The system had been in use for over 10 years, therefore containing a vast amount of legacy data, both structured and unstructured.

The Data Management department was in good control of the process. Manuals and procedures had been developed and quite strictly followed. Minimal data fells between the cracks.

Knowledge workers of the company regarded the implemented system as "good" and didn't complain.

However the software deployment at this company had become so heavily customized that it had deviated a lot from the off-the-shelf product of the vendor. It had become pretty impossible to support, even if the M&S [maintenance and services] fees were reasonable.

The company issued a RFP for a new system.

During the design phase, while communicating with the stakeholders, it became clear that there were additional value propositions which could be added, which would also make the system easier for staff to accept.

It realised it would be possible to better integrate data in the corporate data management system with other data sources. Previously many of the users had Excel spreadsheets "on the side", to record log activities, or to consult a carrier registration journal.

A second additional benefit of the new system was to improve data quality.

Data was analysed prior to being migrated from the old to the new system, and it was clear that there was little automatic control on the quality of loaded data.

Once communication with the end users was established and flowing around the above two subjects, the resistance they were posing to the change dropped. They started appreciating the disruptive innovations proper of the new technology.

The project was executed with a phased approach, using Agile methodologies, with an early software deployment and prototyping of functionality in small increments, tested constantly by a reference group of users.

With this type of approach we (KADME) completed the project transforming (among other disruptive innovations) a relational database of 2000+ tables into 15-20 reasonably denormalized flat tables managed by our NoSQL data store.

Acceleware and Full Waveform Inversion

Seismic interpretation algoirthsm and software company Acceleware says that there is a growing interest in full waveform seismic processing

Helping the path to Full Waveform Inversion. Geoff Clark, chief executive officer, Acceleware.

Acceleware, a company based in Calgary which produces software and algorithms for seismic interpretation and processing, reports that there is growing interest in "full waveform inversion" seismic processing.

Full Waveform Inversion is a highly compute intense process which converts seismic recordings into a subsurface model in a single process – or in other words getting quantitative information about subsurface properties directly from seismic data.

It works by developing an initial subsurface model, and working out what seismic response you would get if the real world was the same as the model. (This is known as 'synthetic seismic').

The software compares the actual seismic recording with the synthetic seismic, and keeps tweaking the model until they match.

The technology was originally developed in the mid-1980s, but it is only recently that the computing power has been available to do it fully.

Even with today's technology, the interpretation / processing work uses a lot of hardware resources, the company says. The work can still involve a lot of manual effort – efforts are being made to reduce this, and also to improve accuracy of the results.

Acceleware has developed a powerful FWI platform (AxFWI) to run the research code provided by customers. It is designed to allow researchers to customize the specifics of the algorithm to the dataset. Acceleware applies its high performance computing expertise resulting in large computational savings.

Acceleware also develops algorithms for another seismic processing technique called "Reverse Time Migration (RTM)", a process to convert seismic data (recorded in time) to seismic data by depth, or calculating how fast the seismic data will go through different areas of the rock (velocity modelling). It is suited for very complex geologies, such as areas with complex salt.

It models the seismic wave going both downwards and upwards, including through complex propagation paths (which are normally just treated as 'noise' in the imaged data).

Technology for RTM is maybe ten years ahead of where it is now for full waveform inversion (FWI), says Geoff Clark, chief executive officer of Acceleware. "RTM is a mature product," he said.

Also, RTM is a significant component of FWI.

In April 2015, Acceleware announced an agreement with Spanish oil major REPSOL to work together developing custom reverse time migration (RTM) seismic imaging software.

The deal is worth an expected $2.1m, with $1.3m payable in the first year, the remainder over a 3 year maintenance period.

Acceleware also makes software for 'forward modelling', which means modelling what seismic response you can expect to record from a seismic survey you are planning.

Acceleware' s software algorithms are used as part of software by several other companies, including Paradigm, Tsunami Development and Geotomo, and sold to some oil and gas companies (such as Repsol) who want to use it as part of their own tools.

Microchips

Acceleware was one of the first companies to do computing on GPUs (graphics processing units), microchips designed partly for computer games, but which are also very good for seismic processing calculations.

Microchip manufacturer NVIDIA has acquired 5 per cent of Acceleware, and it sees the oil and gas industry as one of the biggest users of its 'GPU' graphical processing unit microchips, Mr Clark says.

A typical processing task will run 7-10 times faster on a GPU than on an equivalent CPU, Mr Clark says. The microchip will probably cost double, but that means you are getting about 3.5 times more processing power for the same cost. GPUs are usually thought to have twice the operating cost, because they use more power.

digital energy journal

Sercel: sources and receivers to improve resolution

Sercel has developed land seismic sources and receivers which capture much higher resolution data

Seismic equipment manufacturer Sercel has technology developments with its land seismic source and recording equipment, which can help build up a higher resolution images of the subsurface.

For the best possible image, you need strong, large bandwidth seismic sources and the lowest noise sensors with the most channels (separate recordings).

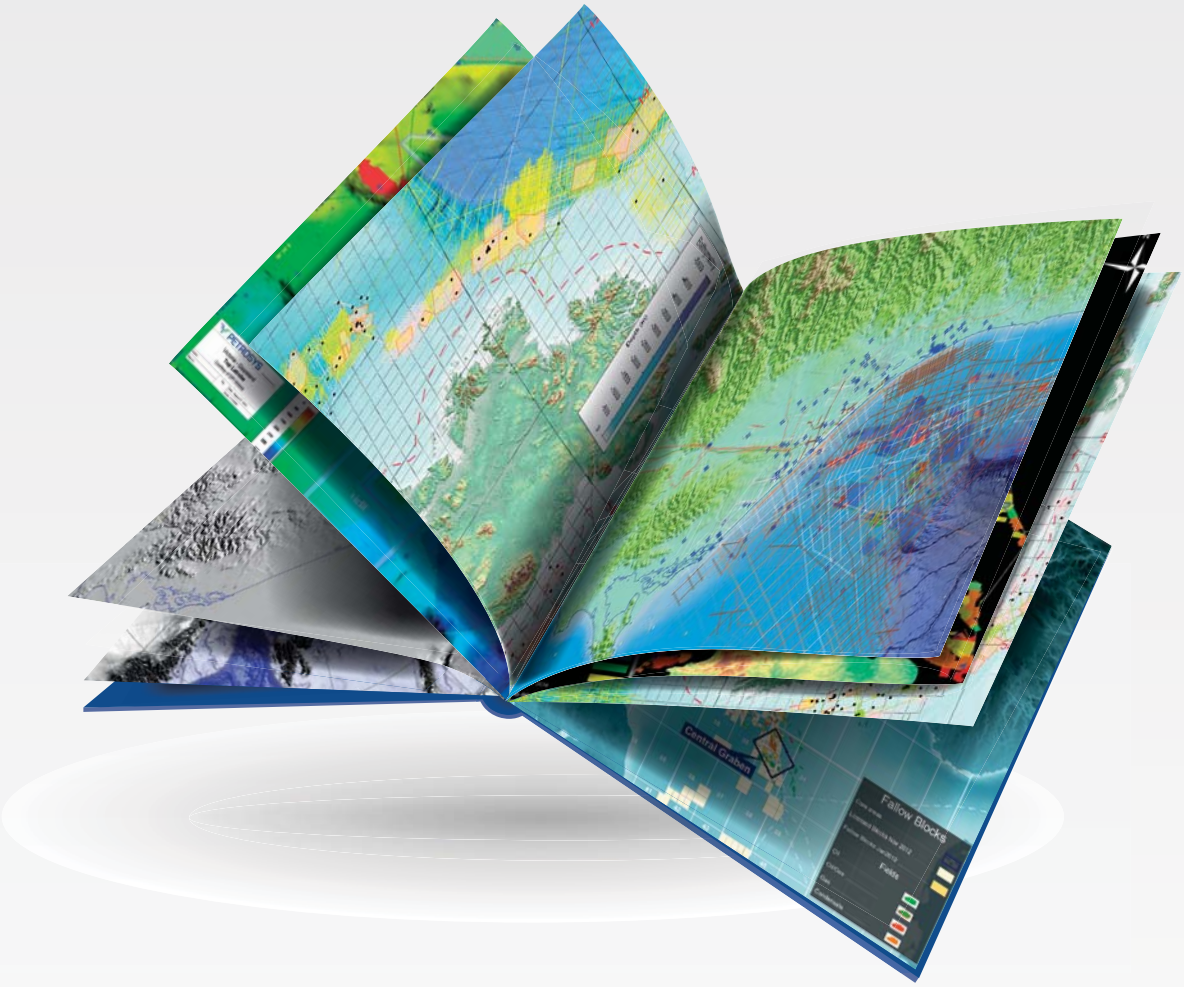
For creating seismic waves, Sercel has launched a new vibrator called "Nomad 90 Neo" which can generate 90,000 lbf peak force and high peak force at low frequencies (62,000lbf at 4.4 Hz, 80,000lbf at 5Hz).

The previous generation Nomad 90 can also generate 90,000 lbf peak force, but the Nomad 90 Neo has a lower centre of gravity and smaller dimensions, for improved manoeuvrability.

There is an 'Intelligent Power Management' system which automatically manages engine speed, which can lead to fuel consumption re-

Sercel's new nomad 90 vibrator has improved manoeuvrability.

MAPPING STANDARDS: A CORE COMPETENCY OF EVERY GEOSCIENTIST



Maps are a canvas used to express complex situations to help support difficult decisions.

In exploring the subsurface, maps serve a number of important purposes; recording and storing information; supporting the analysis of a range of subsurface data; and presenting and communicating information and understanding. Map creation should be a core competency of every geoscientist, used to express complex situations to help support difficult decisions.

Our consultants can help E&P companies define and implement appropriate mapping standards that will help geoscientists present a clear, consistent and concise suite of maps for a variety of purposes where having defined mapping standards has enabled the geoscientists to spend more of their time focusing on the technical content.

Petrosys is a powerful subsurface mapping system that brings all your critical knowledge together on one mapping canvas, our approach to surface modeling enables you to resolve complex challenges and to communicate geological information necessary for decision makers to take the right action. Learn more at **www.petrosys.com.au/transcend**.

PETROSYS

ductions of up to 15 per cent. Normally vibrators operate at a constant engine RPM, Sercel says.

For recording the seismic, Sercel has launched a digital sensor called 'QuietSeis™' which is 3 times less noisy than the previous generation of sensors, Sercel says.

It is much lighter than conventional geophones, Sercel says, at around 1.5kg per channel for a complete system, which all means less crewmembers are needed to deploy it.

Another new piece of equipment is GeoWave® II, a tool for recording seismic data inside oil wells (vertical seismic profiles) at high pressure and temperature. It can work at up to 205 degrees C and 1725 bar.

It has been tested in a geothermal well in Eastern France, acquiring data for 23 hours at 183 degrees C. The tool has seen a full redesign of its electronics.

The company is taking an active interest in using fibre optics for recording in wells, but does not believe that the signal to noise ratio of fibre optics is good enough nowadays for it to replace conventional seismic recording devices in wells.

This is something oil companies have been asking for, for some time, Sercel says, particularly in the US and Middle East.

Sercel is also developing tools to scan the ocean for sea mammals around seismic vessels. Indeed, in some areas, recording could be halted if there were mammals nearby.

The system is commercially available, and numerous field trials are in progress.

Market decline

Sercel expects the seismic equipment market in 2015 to be just $1.1bn in 2015, compared to $2bn in 2013.

Land seismic equipment sales are expected to drop from $1bn to $0.7bn while marine seismic sales will see a much steeper drop from $1bn to $0.4bn, Arnaud Surpas, Executive VP Global Operations with Sercel.

The land seismic equipment sales has been sustained by a demand for equipment for 'supercrews' in the Middle East. The company is currently tendering for 2 contracts, which count for 100,000 channels altogether, he says.

Outside this, the land market is currently very weak, he says.

But the marine seismic equipment market is "really depressed"

NetApp - working on subsurface data remotely

Data management company NetApp has joined together with networking company Cisco, microchip manufacturer NVIDIA, and remote desktop company Citrix, to build a system enabling you to work on remotely stored subsurface data, using just a tablet computer.

Based on a paper written by Osama Qazi, global energy architect with NetApp, and Doug Wycoff, systems engineer, Cisco Systems

Allowing a mobile workforce to visualize the latest subsurface data, wherever they happen to be, is becoming an essential part of upstream oil and gas processes.

Such visualization requires either local dataset copies, which can be difficult and potentially risky to provide, or remote visualization.

A geoscientist interacting with a 3D model of the subsurface of the earth - with the data stored remotely.

Up to now, remote visualization solutions have been complicated to deploy and manage and haven't provided the quality or responsiveness that users expect.

NetApp and Cisco partnered with Citrix and NVIDIA to address the demanding visualization needs of upstream oil and gas.

This new solution, FlexPod Datacenter with Citrix XenDesktop and NVIDIA GRID, was architected to address the challenges of 21st-century exploration and production.

It results in a solution that makes visualization accessible to everyone who needs it—including users with thin devices such as tablets.

A single, reliable infrastructure is able to address a full spectrum of visualization needs - those of local users, visualization rooms, remote office users, and workers in the field.

The upstream environment

The upstream environment has needs that are

significantly different from those of typical IT infrastructures.

It's not uncommon to run hundreds of different applications with a broad mix of I/O needs that can include both sequential and random data access, extremely large file sizes, and huge numbers of smaller files.

Workflows continue to evolve because of the rapid growth in dataset size and the need to integrate diverse, multidisciplinary data types to more accurately understand the earth's subsurface.

Feeding all this data to visualization workstations outside the data centre has become increasingly difficult.

Network connections lack the necessary bandwidth for real-time operations and workflows increasingly span organizational boundaries.

Continued reliance on visualization workstations is creating significant challenges.

Copying data to a workstation to facilitate visualization, which is sometimes the only option, wastes valuable time while transfers take place.

Data on local workstations may not be protected by backup or disaster recovery, risking data loss.

Storing data on workstations outside the data centre increases security risks.

Moving data outside the data centre or across international boundaries may violate regulations and corporate governance requirements.

Workstation failures can have a big impact on the productivity of geologists, geophysicists, engineers, and other visualization users.

Software licensing costs per seat can be extremely high, while productivity per license may be low.

Collaboration, both local and remote, often requires additional data movement, creating delays of hours or even days before collaboration can begin.

Bringing a new workstation online to support a new user can take weeks.

Setting up workstations for workers in remote locations and supplying them with data creates additional challenges and additional expense.

The upshot is that significant opportunities exist to increase productivity, enhance collaboration, decrease risks, simplify the overall IT environment, and decrease costs.

The NetApp solution

The FlexPod Datacenter with Citrix and NVIDIA solution brings together best-in-class components to overcome the challenges just discussed.

Data is centralized in the data centre, eliminating the need for data copies, reducing risk and decreasing management overhead, and increasing productivity.

An authorized user simply requests a desktop or application session. Data is processed and rendered within the data centre, and the results of visualization are transmitted over the network to the user.

FlexPod

FlexPod is a proven data centre solution from NetApp and Cisco, with a flexible, shared infrastructure that easily scales to support growing workload demands without impacting performance.

FlexPod has been widely used in virtual desktop infrastructure (VDI) deployments for the last four years.

It offers faster deployment with less risk. The pre-validated design means that you can get FlexPod up and running quickly and deploy applications faster with fewer problems.

It offers the ability to scale up and out. FlexPod grows and adapts to meet your changing needs.

It offers investment protection. The scalability and flexibility of FlexPod give the solution a longer life. You can easily repurpose components to address changing needs.

Also NetApp, Cisco, and Citrix partnered to provide cooperative support. This approach resolves 98 per cent of support issues on first contact.

Storage

The NetApp FAS8000 storage hardware reduces overall storage costs while delivering the necessary I/O performance for virtual desktop infrastructure (VDI) and demanding geology and geophysics applications.

It supports both all-flash and hybrid storage configurations.

To deliver the necessary throughput and low latency required for VDI, all-flash configurations are typically used.

All-flash FAS nodes can be combined in the same scale-out cluster with hybrid (HDD plus flash) storage nodes suitable for storing large datasets with high throughput.

You can also replicate or back up your VDI environment (from expensive SSD storage) to more economical HDD storage on other nodes.

Servers

Cisco UCS C240 M4 rack servers are typically chosen for the FlexPod Datacenter with Citrix and NVIDIA solution.

These servers feature extended memory for faster rendering, support of bigger datasets, more desktops per server, and low latency.

This server supports up to two double-wide GPUs in a slim 2U form factor. GPUs can be used to perform parallel tasks (GPU computing) as well as visualization.

Overall oil and gas benefits

Here are some benefits specific to the up stream oil and gas industry.

- Geoscientists, engineers, and business de cision makers can see important results in near real time, without the bottlenecks that result from transferring huge datasets over network connections or by mail.
- Collaborators view and manipulate the same images, eliminating potential points of confusion and miscommunication and saving valuable time.
- You can eliminate the expense and com plexity of dedicated workstations by re placing them with a much more efficient and scalable shared resource capable of supporting workers wherever they happen to be.
- You can have new infrastructure up and running in less time with less effort.
- Because FlexPod Datacenter is well es tablished, many resources exist to facili tate and streamline deployment. The com bination of FlexPod and XenDesktop is well understood.
- You can size your UCS servers to address the needs of power users using GPU pass-through or shared GPU seats using vGPU.

Paradigm and subsurface modelling definition

Oil and gas subsurface software company Paradigm has launched Paradigm 15, a new version of its subsurface software, aiming to improve the definition (resolution) of subsurface modelling and imaging which can be achieved, while minimising cost and risk.

It aims to make it easier for people from different disciplines to develop more productive targets, integrate data from other companies, help drillers drill fewer but better wells and reduce non-productive time in drilling. So, no small ambition.

New developments in this release include engineering and application enhancements in Quantitative Seismic Interpretation (QSI), expansion of its high definition platform, increased connectivity with third party databases, and an expansion of it collaborative workflows highlighted by a tighter integration between its earth modelling and velocity determination tools.

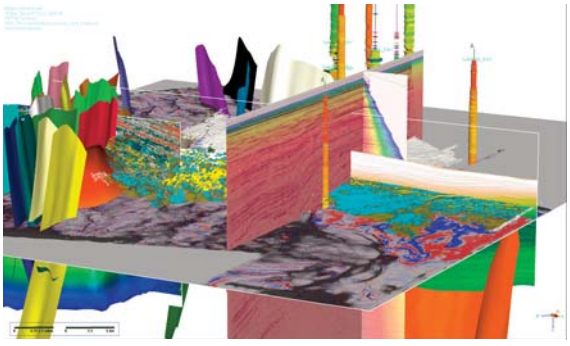
The core "high level theme" of Paradigm 15 is to recover high resolution data, visualize it and [reservoir] model it, retaining the high resolution of modern surface and subsurface acquisitions, says Duane Dopkin, executive VP for geoscience with Paradigm.

Fractures

This includes improvements in the tools to understand fractures, with updates to Paradigm's Geolog Formation Evaluation platform and "EarthStudy 360" technology, a new way to get an in-depth understanding of the subsurface from rich azimuth seismic data acquisitions.

"In Paradigm 15 we place a lot of emphasis on recovery of all scales and types of fractures" Mr Dopkin says.

Geolog introduces new wellbore integrity and Geomechanical modules to better understand the capacity of formations to fracture. EarthStudy 360 measures seismic properties that vary with wave propagation direction including amplitude and velocity. The rich sampling of these "anisotropic" parameters allow geoscientists to more accurately measure fracture orientation and intensity with high resolution inversion methods.



Early assessment of facies distribution using elastic properties and AVO analysis provides an accurate estimation of reservoir distribution and heterogeneities.

The technology is suitable for both fracture carbonate (dolomites and limestones) and shale reservoirs.

In addition to the seismic inversion methods, EarthStudy 360 also is capable of recovering faults and fractures with "Diffraction" imaging, a special form of seismic imaging to emphasize diffracted or discontinuous energy in seismic data.

"Our method of imaging diffractions in seismic data based on full azimuth data is both robust and unique, Mr. Dopkin says. It reveals fractures not recoverable with traditional seismic methods.

Borehole and seismic information can be integrated in Paradigm's SKUA subsurface modelling, supporting both Discrete Fracture Network Models and Probabilistic Fractures Models. "The former is popular for modelling fractures in shale reservoirs, while the latter is more suitable for modelling fractures in strongly deformed structural areas."

Velocity Modeling

In terms of seismic processing and imaging, Paradigm has two tools which are considered 'industry standards' – GeoDepth, a velocity determination and velocity modelling building system, and SKUA (Subsurface Knowledge Unified Approach), a subsurface modelling tool, particularly applicable for modelling complex structures such as salt bodies, Mr Dopkin says.

Using GeoDepth and SKUA together, you can "build reliable geologically-constrained velocity models," he says.

Companies are putting more and more effort into modelling velocity in more sophisticated ways, including modelling complex directional (anisotropic) velocity dependencies. The integration of these two systems allows geoscientists to better correlate earth properties with seismic properties.

Paradigm 15 also incorporates bore hole (VSP, Check Shot) data into its velocity updating (tomography) system. This adds additional constraints on the velocity model and reduces the plausible models that honor the data.

Duane Dopkin, Executive Vice President of Geoscience.

All of this helps reduce subsurface uncertainty and improve drilling placement, he said.

Maintaining high resolution

Paradigm focuses on software tools to maintain resolution of recorded data throughout the entire processing, imaging, interpretation, and modelling workflow to increase geoscientists understanding of the subsurface, he says.

Many companies invest millions of dollars in acquiring high resolution seismic and borehole data but then lose the value because they don't use high resolution software solutions to visualise and model them
Ultimately the aim is to represent the earth model at the maximum resolution captured by the original or processed data without compromises, he says.

Quantitative Interpretation

The 15 release also aims to promote quantitative seismic interpretation, getting rock and fluid properties directly from seismic data, rather than techniques that rely on simple observation.

"We are trying to equip the generalist seismic interpreter with quantitative seismic tools," he says.

These methods make it possible to generate quantifiable "direct hydrocarbon indicators" from seismic data without leaving the SeisEarth interpretation canvas. This is a powerful work efficiency and quality enhancement, he says.

By combining pre-stack data with post stack

data, interpreters can carry out seismic inversion operations directly in the interpretation system.

Data management and database connections

Paradigm is also strengthening its connectivity to 3rd party databases in the Paradigm 15 release.

Companies using other software packages can use Paradigm solutions without disrupting their existing workflows, he says.
"We have a strong history of developing connectivity solutions to both large and small companies," he says.

Paradigm 15 substantively expands its connectivity to Schlumberger's Petrel solutions and also provides well data connectivity to Halliburton's RECALL well database solution.
The foundation of Paradigm's data exchange makes use of the Energistics RESQML standard, he says.

The ultimate aim is to have all data in a 'vendor neutral' format, he says. "That's where the industry wants to be and where we want to be." We might be nearer to this than many people think, he said.
Standards like RESQML are getting a "lot richer in scope", he said, which means that it is possible to do a lot more with them. "They are a lot more readily adaptable to applications."

Paradigm's biggest differentiation factor is its ability to intersect "data centric" and "model centric" worlds, he said. "We understand hove to bring those worlds together."

The end result is the best earth model you can make, with the data you have, he said. "We can work on the bigger picture."

Using actuarial science for reservoirs

Actuarial Science, the discipline of assessing, forecasting and valuing risk developed for insurance and investment, could also be applied to the oil and gas industry to price the risk of not getting the production you hope for. We spoke to expert Iain Poole

Actuarial Science, an established discipline for working out risk in the finance and insurance sector using statistical and mathematical methods, may have something to offer the oil and gas industry.

The actuarial profession is established, regulated, and acknowledged by the financial world as having the foremost body of knowledge in understanding risk. The oil and gas industry has many experts in maths and statistics, but actuarial practice has distinctive processes and philosophy behind it, says Iain Poole, head of oil and gas consultancy with UK actuarial service company Barnett Waddingham.

Mr Poole has experience in both geology and actuarial science.

When comparing standard oil and gas procedures with an actuarial equivalent, "there's an element of commonality in the mathematics and an element of difference," Mr Poole says. "The financial and upstream worlds speak different languages."

To explain the actuarial approach is probably beyond the scope of an article in this magazine; it may be enough to comment on an actuarial view of the cost of uncertainty. To value a risk, you have to estimate the expected value of losses. The price of insurance cover reflects the level of uncertainty in your numbers, Mr Poole says.

A typical insurance pricing process is to value the P50 risk (where the outcome will be better than estimate 50% of the time and worse 50% of the time.) Then you have to add a margin so that the insurer is more likely than not to be able to meet its claims, to some agreed level of confidence.

Then you add a small margin for the insurance company's expenses and profit, and a further margin to cover the possibility that your assessment is slightly wrong, "which it probably will be," Mr Poole says.

So the more sure you are, the less risk premium you need to add.

To put it another way, actuaries can come up with a value for any risk, whether insurable or not. Similar approaches can apply to valuing the risk of not achieving some production or revenue target.

From the client's point of view, "the more you can clarify and describe all the uncertainties in terms that the financial community understands, rather than in industry terms, the cheaper your insurance or capital is likely to be."

Actuarial methods could be used in many decision analysis and risk assessment tasks in exploration and production, including appraising reservoirs, production forecasting and economics, Mr Poole says. The scope can include geological uncertainty, and risk associated with new projects.

This is the first time actuarial principles have been applied to oil and gas exploration, the company believes. The service is offered to anyone looking to value an oil and gas asset share, project or company, or answer questions such as "How much appraisal is enough?"

Iain Poole, head of oil and gas consultancy with UK actuarial service company Barnett Waddingham.

When a bank or equity investor is asked to finance an oil and gas project, to some degree they need to trust what the oil company is telling them, since banks do not always employ oil and gas experts, Mr Poole says.

But the bank will maintain a precautionary element of scepticism; the amount of caution will be reflected in the availability and cost of any capital the bank may provide, he said.

For example, an actuarial specialist assessing a production forecast might allow for increased uncertainty if it was made using analogy only, or without history matching, or using a 'proxy model', where some of the resolution had been removed to make computation faster.

This basically means removing knowledge, as does 'upscaling'. "In the financial world you always pay for uncertainty or lack of knowledge," he says.

"I've been looking at gas forecasts in Southern North Sea, where you can see the proxy model and a fuller reservoir model yield different results, especially for P10 and P90."

How to reduce drilling costs

Top tips for reducing drilling costs include asking questions about the drillers' management of their blow out preventer (as a means of reducing BOP related NPT) and paying more attention to the well engineering process, said Mike Dyson of Navigant

A deepwater drilling rig can have, "in many cases", 25 per cent non-productive time, said Mike Dyson, director, oil and gas practice with professional services company Navigant, speaking at the Finding Petroleum forum in London on May 27, "Finding Oil in Atlantic Basins."

Mr Dyson was formerly BG Group's general manager well engineering, and has 30 years' of experience with Shell and BG Group.

One of the biggest causes of the high non-productive time is the blow out preventer (BOP) stack. "It tends to require a lot of maintenance" he said.

"Macondo shone a light on the way we manage pieces of equipment like that and the work we now do to make sure these things are reliable is expensive."

A BOP is very old technology, he said. "A subsea BOP is basically a land BOP with some accumulators and a control system around it. There's very little instrumentation. It is incredibly simple and certainly low tech."

To reduce the risk of BOP related non-productive time, it might be smart for operators to ask questions about how the BOP is being maintained when you hire a drilling rig, he said.

You could say to the drilling contractor, "Show me the BOP track record, convince me you have the right quality of people managing that equipment, show me you're tracking maintenance and repairs, you're using spare parts supplied from a reputable manufacturer, the tests are carried out as per legal and company requirements."

"If necessary I suggest being prepared to pay more money to accept a higher quality solution."

One conference attendee commented that he had seen as many problems with BOP reliability on new rigs as on old ones. "I tend to agree, that's certainly been my experience as well," Mr Dyson replied.

Mr Dyson was asked whether it was due to BOPs getting more complicated in response to Macondo.

"I don't think BOPs have got overly complicated. I think it's mostly around the maintenance programs that are now more rigorous, and the need to rebuild BOP technician competency which attracts more attention on those kind of rigs."

"Have we gone overboard on Macondo? I personally don't think so, I think it's tightening up what should have been happening anyway."

Better well engineering

Oil and gas companies would also benefit from being more focussed on well engineering, he said.

"I hold up my hand and declare that I'm a well engineer. But in general, I think we've seen fairly disappointing upstream oil and gas project performance and well engineers have played their part in that."

Many oil and gas companies see well engineering as a non-core activity. "In some companies, it's been delegated to drilling contractors and service companies, without the management controls and interest it should have had, given the costs and risks to the business."

Mr Dyson explained the basic well delivery process. He said "many companies could improve their well delivery process. For example, most do not have a rigorous enough "decision gate" process. "I've seen projects go through to spud where significant risks and opportunities has not been thought through and managed."

The drilling costs should also be worked out more thoroughly, without giving senior management an opportunity to interfere.

"Many times there's been an accurate bottoms up calculation of the cost, then senior leadership have said, that's too much, you must do it for x per cent less."

The lower estimate gets made in the plan, without any specific actions to deliver it and, guess what - it doesn't materialise," he said.

"There's a degree of honesty needed, and openness, on what a well is going to cost, so everybody understands and owns the numbers." By all means set separate performance improvement goals but avoid baking them into the plan.

"One of the biggest causes of drilling non productive time is the blow out preventer (BOP) stack" - Mike Dyson, Director, oil and gas practice with professional services company Navigant, formerly BG Group's general manager well engineering.

You can also continually challenge the industry partners and service companies to find ways to do it more efficiently and effectively, he said.

Contracting

In your contract with the driller, "I would certainly advocate incentivising for performance and safety," he said.

If you end up with a choice of a more expensive rig with a 'hot crew' which has worked on the rig before, or take a cheaper rig with a crew which has never worked together, he said. "In many cases I'd say, take the rig with the 'hot crew'."

Oil companies should not micromanage their drilling companies. "The concept of the operator planning, and contractor executing, I think is correct."

In your contracting with suppliers, "you should challenge prices, rates and margins, but you have to do it constructively," he said.

"Buyers often ask for large discounts. If that's coming out of a large profit margin it's not an unreasonable request. But make sure there's give and take in there, for example offer to extend the contract in return."

Crew competency

For better drilling, you should also think more carefully about crew competency. "There's a big difference between a good drilling crew and an average drilling crew."

"When drilling a well, you've got one shot – make the most of it with the best planning and people you can."

Crew competency is arguably a contributory factor to the Deepwater Horizon disaster, he said. "I have read elsewhere that none of the regular crew on the Deepwater Horizon crew had a university degree," he said.

"We're talking about the way we place significant investment, and certainly a big opportunity for risk and incident, in people who are very well intended and work very hard. But in many cases they are not educated to a level that would enable them to question decisions to the extent that they could have," he said.

A useful initiative is "crew resource management", an approach which comes from the aircraft industry, where you make sure different people in a team are communicating and questioning each other, he said. "That's an example of something we can do more of in the oil and gas business in drilling and operations."

Mr Dyson was asked about his views on the best way to handle local content requirements, where the country whose water you are drilling in demands that a certain number of crewmembers come from that country.

The demands are getting more technically focussed, for example stating that you must have a certain number of people at the higher technical roles, the member of the audience said.

"I think it certainly is a big requirement, and part of the overall upfront understanding of what is required, part of the decision on whether to make an investment in a play, in a country," Mr Dyson replied. "I would advocate it needs to be taken seriously."

"It's not an unreasonable expectation that you'd spend money in the country and help build capability. It needs to be embraced proactively and creatively."

"So hire good people from that location, put them into the company training scheme, and move them around the world. I'm a big believer in diversity, I think people add value wherever they work, even if it's not in their home country. So it's a fact of life to be embraced.

"I worked with folks in BG Group operating in East Africa, they certainly made it work. Not an easy challenge though," he said.

Reducing spec

You may also be able to reduce the costs of the well by constructing it to a lower specification.

Companies tend to go for very conservative designs, making sure they can handle any pressure or temperature they might possibly find, and have options to do sidetracks.

Companies also often overdesign for low pore pressures, making the well stronger than they need to (or with more strings of casing), in case the rock is not as strong as expected.

"We might be better off designing for P90 (the conditions you are 90% sure of finding) and accepting that in some cases you won't get to the objective, he said.

Comparing performance

You might identify savings by improving performance of different rigs, and by different crews on the same rig. For example you might find that one crew can do 20 joints of casing an hour, which is "not bad". But another crew can do 30 joints of casing an hour. That alone can lead to a saving of $230,000 on a well. "And that's an operation we repeat many times."

"By understanding why there is such variability and raising everybody up to the best performing crews and rigs, there's a huge opportunity for everybody to do better," he said.

"The proviso is the crew doing 30 joints an hour had better be doing it safely. But in my experience, an efficient operation is a safe operation. They usually go hand in hand."

IT

Information technology can also help drill wells faster in many ways.

Drilling wells is much safer than it was 25 years ago, but not much quicker, he said. "Let's bring some modern Information technology to drilling."

In his previous employment, "real time data centres, where you bring in information from key drilling activities to a central location and have experts look over the data, saved us a lot of down time and "train wrecks" in terms of bad decisions," he said. "That kind of overview can be very powerful."

There are many ways to better monitor what is happening on the rig. For example "use a video camera to work out what's happening on the drill floor. And by using (low cost) internet connected sensors the industry has an opportunity to collect and analyse lots of performance data in real-time.

Companies currently usually collect data from drilling rigs every 15 minutes, but that might be too long a time interval to give you useful notice if something is going wrong, he said.

Also, geosteering and automated rig equipment "can make a substantial difference," he said.

Costs will drop

Drilling costs are dropping whatever you do, he said.

The drop in exploration activity, in particular, is leading to less demand for drilling rigs. With many rigs on a 1-2 year contract, there is a delay between a drop in the oil price and a drop in drilling rig prices, he said. But prices are starting to drop now.

There are "lots of new-builds still under construction, which will further force the cost of drill rigs down."

At the same time we can expect to see reducing fuel costs for drilling, and reducing materials and talent (people) costs. There will be less competition for drilling licenses.

In addition, there is room to take costs out of the supply chain, which has become bloated over the past 5 years.

Drillers' competition for customers could encourage them to make more effort to try to drill more efficiently. Standard day-rate payments to drillers "are not that closely linked to how quickly and safely the operation is conducted," he said.

As a result of the low day rates, "many low spec rigs will, I think, disappear from the market. Day rates may be barely sufficient to pay an operating cost for a rig. There will be consolidation amongst drilling contractors and also service companies," he said.

Watch Mr Dyson's talk on video and download slides at www.findingpetroleum.com/video/1339.aspx

OFS Portal®

Founded in 2000, **OFS Portal** is an organization which consists of diverse supplier members who are committed to promoting eCommerce and reducing cost. We have a non-profit objective to ensure we promote the best approaches for the industry. In addition to advocating strong protection for the security and confidentiality of electronic data, **OFS Portal** has gained the trust and confidence of the entire upstream oil and gas industry. We do this through our proactive advocacy approach toward best practices to reduce costs and complexity while increasing the speed of adoption.

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OFS Portal Advocates Best Practices

First, by drawing on the industry's experience, OFS Portal's Integration Competency Center prescribes best practices and provides guidance for practitioners and novices to achieve the best return on investment. Speed and breadth of adoption have a significant impact on returns and that is why OFS Portal advocates the use of best practices. OFS Portal has the depth of experience and the thought leadership to guide you through to a successful implementation of eCommerce in Oil & Gas

OFS Portal Supports Standardization

Second, OFS Portal brings its members' intimate knowledge of the global industry to the worldwide effort to develop data and business process standards suitable for the upstream oil and gas industry. OFS Portal and its members are active participants in PIDX INTERNATIONAL (Petroleum Industry Data Exchange, Inc.), the oil and gas industry's eBusiness standards body.

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PIDX meeting - spotting fraud and kindle curiosity

The June 3 2015 meeting of Petroleum Industry Data Exchange (PIDX) in London, covered how to use data analytics to investigate commercial fraud, using data to kindle rather than kill employee curiosity, and the plans of PIDX's new CEO

At the June 3 London meeting of oil and gas e-commerce group Petroleum Industry Data Exchange (PIDX), Richard Palmer, director of fraud investigation and dispute services with Ernst and Young, talked about how the company analyses commercial data as part of a fraud investigation.

Fraud is more common in the oil and gas sector than most other industries, he said. EY does an annual industry survey about fraud, asking respondents from different industries if their company has experienced a significant fraud over the past 2 years. In the last survey, 16 per cent of oil and gas respondents said yes, compared to an industry average of 12 per cent, he said.

When a corporate fraud investigation takes place, "typically it will be one of the big four professional services companies doing it," he said, referring to Deloitte, PwC, EY and KMPG.

Mr Palmer leads a team of 50 staff members, of which a third have "an advanced degree or PhD in data".

EY works with all kinds of electronic data, including transaction data and data recordings of telephone calls. An investigation can go back 6 years, involving massive amounts of data.

One recent example was with an investigation on a Western company in China. The EY investigation team noticed there were more taxi receipts than it expected. They found that there was an industry in China which will print taxi receipts, which can then be used as cover for a bribe payment.

Sanctions are an enormous risk for oil and gas CEOs, he said. Typically every dollar that breaks a sanction leads to one dollar fine. Companies often ask EY to go through their systems, to make sure they are not breaking sanctions, he said.

If companies do get caught up in something, the first question company executives ask is "how bad is this going to be", followed by "how do we stop this happening again." This can be followed by putting controls in place.

A typical investigation can look through company transactional data, reference data, together with business intelligence data and social media data. It has investigation tools to look for patterns, and make statistical and predictive analysis.

EY has special analytic tools to evaluate unstructured data. For example, it can search financial systems for names of companies known to be in Libya (a country subject to trade sanctions) and see if any money has been paid to them.

It can look for purchases where the payment was made before the goods were received, rather than afterwards.

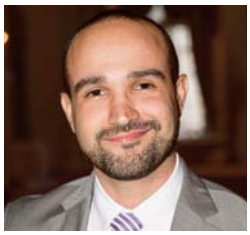
A bribe could be labelled in the accounts as a "consulting fee, onetime payment, special advance, good will payment, incentive payment, donation," he said.

You might also look at commissions at over a certain percentage, or unusual correlations between entities.

Many companies are still using 10+ year old transactional systems which typically hold bank data for 3 months, he said. "One Middle East bank had data on Swift transactions in paper boxes."

Better use of PIDX standards should help drive down fraud, he said. "The more straightforward processing you have, the less opportunity there is for someone to do something fraudulent."

Developments at PIDX



Alejandro Del Palacio, the new interim CEO of PIDX.

PIDX (Petroleum Industry Data Exchange), the oil and gas industry body developing standards for e-business, has appointed a new interim CEO, Alejandro (Alex) Del Palacio.

Mr Del Palacio is formerly director of business development at Sullexis, a company based in Houston. He has already been involved in PIDX for two years, being elected to serve as an acting chairperson on PIDX's Standards and Guidelines committee in December 2013 and becoming the chair of the committee in September 2014.
Mr Del Palacio has also worked with a number of National Oil Companies implementing procure to pay systems and business process re-engineering.

In his first few months at PIDX, "I've been looking at what we've done really well and what we need to improve," he said. We have to look at "what we need to give our current members and what do we need to do for non-existent members."

"Companies that are members of PIDX don't necessarily know all the standards we have," he said.

PIDX has recently appointed three new board members: Angelica Tritzo, CIO Turbomachinery Solutions, GE Oil and Gas; Andrew Mercer, Vice President, Global Projects IT&S at BP; and John Tombari, Marketing and Sales Portfolio Manager at Schlumberger.

The main argument for PIDX standards, said Bill le Sage, a former chairman of PIDX's board of directors, is to simplify work and help improve staff productivity.

Phillips 66 – streamlining data

Streaming data systems at Phillips66 - Steven Waegenaer.

Steven Waegenaer, IT business analyst with Houston oil and gas midstream and downstream company Phillips 66 talked at the conference about the company's efforts to streamline its data systems, so it is easier for employees to get the data they need.

It hopes to improve the mood of its employees, so they are more interested in searching for new insights from the data, or, as Mr Waegenaer put it, the systems can "kindle the power of curiosity in our employees."

The company would also like to bring in more data for field staff, including weather data and traffic data.

The team to streamline the data has 7-8 members, including four IT people, one analytical business person, and two domain experts. Currently "employees say 80 per cent of their time is about collecting data," he said. Behaviour is more predictive than reactive. Most of

the reports are static, rather than dynamic (generated on demand).

The company's data is still "extremely siloed", he said. The company has 950 different sites, and there's "a lot of multiple versions of the truth."

It has data from card processing systems, point of sale systems, suppliers, consumers and other forecourt data. The company has 915 petrol forecourts, with transactions coming through every 10 minutes.

QLIK – expert centric intelligence

Software company QLIK, headquartered in Pennsylvania and founded in Sweden, aims to deliver visual analytics to customers to the point where people make decisions. This is where analytics can provide the most value.

Qlik's solutions are used by "5 of the 10 largest oil and gas companies," said Niall Gallacher, global director industry solutions, speaking at the PIDX conference.

In the oil and gas sector, it is used in many sectors, including exploration and production, supply chain, asset integrity management, logistics and HSE.

It is used to help people understand what happened, why it happened and make predictions of what is likely to happen, he said.
It can be used to analyse production, supply chain management, staffing, assets, incidents, costs.

It is frequently used to combine data from multiple sources to provide additional insight, not traditionally available from individual system reports.

For example, with asset integrity management, it is often important to understand if there are correlations between downtime, asset age, rotable components, HSE incidents and the field engineering team which last undertook preventative maintenance, Mr Gallacher said.

Then you can look for similar trends in other assets, all in one place without the need to run separate reports from different systems.
As a consequence, it is also often used for scenario planning and cost planning.
Altogether, the company has 36,000 customers.

CC Hubwoo

CC Hubwoo, a cloud-based spend management and business process automation solutions company, recently helped US natural gas and coal company Consol Energy re-organise its invoices, said Karen McKeever, presales manager with CC Hubwoo, speaking at the PIDX conference.

Consol now processes 156,000 invoices annually with 5 full time employees (reduced from 14.5), she said.

The company managed to increase the number of invoices which could be matched against purchases in the system from 40 to 96 per cent.

By getting invoices ready for payment faster, it was able to take advantage of negotiated deals to make payments earlier, of $13m.

Before using CC Hubwoo, Consol "had a big problem with invoicing and processing in a manual fashion. They were not able to match [invoices] against pricing agreed with operators."

Presentations from the conference can be downloaded at http://www.pidx.org/europe-spring-conference-2015/

Blame high costs on engineers' linear thinking?

One possible target to blame for high costs in the oil and gas industry is engineers' linear thinking, suggests David Delvin, Vice President, EMEA Energy Mining & Metals Industries, with Hitachi Consulting

Everyone is talking about the high costs in the oil and gas industry and how to reduce them.

One possible target of blame is engineers' 'linear thinking,' says David Delvin, Vice President, EMEA Energy Mining & Metals Industries with Hitachi Consulting.

By this, he means that oil and gas engineers think things should happen in a linear type of way, where one thing leads to another thing. But linear thinking can lead to unnecessary complexity, which leads to increasing costs and lower productivity. That's why David works towards helping people work in a more responsive and collaborative way.

Helping improve oil and gas operations - David Delvin, vice president EMEA for Energy, Mining and Metals, Hitachi Consulting.

It is not hard to find examples of escalating costs in the North Sea.

One client noticed that the cost of his like – for - like compressor upgrade had risen three fold between 2000 and 2014.

Overall lifting costs (the costs of oil and gas production) have been rising 12 per cent a year. "There's no other industry that can get away with that cost inflation," he says.

Of course, changing the way people work is difficult. Engineers sometimes struggle with the softer side of performance improvement and don't adequately focus on culture change and behaviours, because they see it as difficult to influence and measure he says. "So we talk about process driven behavioural change."

"If you aim to change behaviours though looking at processes and making them much more efficient, you get people's attention better."

It is also possible to look at how the aerospace and automotive industries have successfully managed to remove complexity, he says.

Wrench time

As an example of processes which can be improved, consider that "wrench time", the time which offshore workers spend actually doing maintenance tasks (or other tasks which require a wrench) can be as little as 40 cent, Mr Delvin says.

An offshore worker's typical 12 hour working shift includes 29 per cent of time doing maintenance tasks, 8 per cent on official breaks, 8 per cent on unofficial breaks, 8 per cent waiting for other people, 17 per cent meetings, 9 per cent planning, 13 per cent administration and 8 per cent other.

One of the biggest causes for low wrench time is poor planning. People don't allow time for reactive tasks (maintenance person-

nel also need to fix faults), and they don't recognise how much poor planning can set off a chain of events, disrupting jobs elsewhere, he says.

There is often insufficient understanding of the task, what resources are needed and inadequate time allowance for preparation at the job site, he says.

Operators also often don't spend enough time making contingency plans to ensure that disruptions don't adversely affect the productivity of technician resources.

Productivity can be an emotive subject, particularly if there is any suggestion that individuals aren't pulling their weight.

"People will quickly make assumptions about what is causing poor productivity," he says. You should "listen to what people have to say but always validate assumptions."

Hands on approach

Hitachi takes what he calls a "very hands on" approach with its consulting, often with consulting staff going offshore.

"I would love to say that you can do it [consulting] from the board room.

But it doesn't help your classical operations guy, you've got to be there where the decision are taken. So we end up working in places like gas plants in Qatar and compounds in Nigeria."

Hitachi's consulting process starts with a comprehensive analysis of the company's processes, to try to understand where the gaps are, and to make sure people who need to change how they work can also see the gaps.

"If you're not able to prove to people that there are gaps, pressure points and strains, it is quite difficult to get staff mobilised and engaged in the process [of fixing them]," he says.

You need to "establish that there's a need, there's a gap, that it's possible to make the change required.
The next step is "a complex tactical process - of bringing people through the change curve."

Hitachi Consulting is typically asked to support and operate delivery improvements in an asset's overall business performance. This often requires technical and process improvements, as well as improved collaboration between various stakeholder groups such as offshore and onshore.

"We tend to work alongside business units or asset groups," he says. Often they may have identified a number of operations or functional teams which are underperforming in relation to their business needs."

"We typically focus on integrated asset planning, logistics efficiency, maintenance effectiveness," he says. "There's a lot of data, process re-engineering and organisational effectiveness involved in making the changes required."

"We utilise technology and its information flows, to achieve better data management and deliver better decision making, based on more visible fact-based views on how assets are performing."

digital energy journal

Petrotechnics - awareness of your elevated risks

Aberdeen-based software company is seeing big interest in its 'Proscient' solution to help offshore workers be more aware about elevated risks, so they can plan their work accordingly

One thread common to the Piper Alpha, Texas City Refinery and Deepwater Horizon accident investigation reports is there were multiple factors which elevated risk levels leading up to the incidents.

Taken on their own, they may have been considered to represent an acceptable level of risk, but unfortunately their cumulative impact on risk was much higher than was realised at the time. They also represented multiple opportunities for preventing the incident from occurring or escalating.

"In all 3 incidents, there were multiple prevention and mitigation barriers which failed, each representing an opportunity to stop the accident from happening or at least mitigating its consequences. The problem in all 3 incidents was the information which could have informed and possibly changed the decisions that were made was not easily available," said Mike Neill, North American President of Aberdeen software company, Petrotechnics.

"Most people have a keen survival instinct so when hazards are obvious, they will react to avoid an incident," Mr. Neill continues. "If you walk down some steep steps and there is not a hand rail, you naturally proceed with some caution or you do not go down at all being aware of the fall hazard. Today, few people smoke cigarettes because they are aware of the publicized cancer, heart attack and stroke risk. 50 years ago the majority of people smoked. The risks were the same but the population at large were unaware of them.

These simple examples show how people change their behaviour and make different decisions based on information received, and as a result, they reduce their exposure to risk.

The aim here is to show if information about risk factors had been more widely shared in the case of Piper Alpha, Texas City and Deepwater Horizon, these accidents might not have occurred.

In hazardous industries, "multiple layers of protection" are used so organizations are not just relying on the performance of a single barrier, recognizing that each of the multiple layers may not be perfect.

Swiss cheese is a commonly used metaphor for the protection layers. The holes represent the barrier imperfections, and incidents occur when all of the holes in each of the layers line up, a failure of not just one but of several barriers.

"When major accidents are investigated, it is typical to find there were many opportunities for people to intervene and prevent the incident from occurring or escalating. Typically the reason cited for lack of intervention was they did not have all the relevant, up-to-date information to make better decisions. They were unable to join up the dots, so to speak. They did not see the holes in the cheese lining-up," says Mr. Neill.

Petrotechnics' flagship operational excellence management platform, 'Proscient,' can be used to understand and manage elevated risk associated with operations.

For example, the software can help everyone on the platform be aware if there is a planned maintenance task which will elevate risks, such if you have to temporarily break pipework or a containment system to do a job.

You might be planning to inspect electrical junction boxes, which means there is a possible source of an ignition spark. Normally the junction boxes are closed and sealed, so any gas in the air can't reach inside. With Pro-

scient, an icon will show on a map of the plant that the ignition barrier system is currently compromised.

The system can share information about particularly high-risk tasks being carried out, such as a heavy lift over a live plant or performing "hot work" with a naked flame or ignition source.

If safety equipment is unavailable, such as if the sprinkler system is blocked with scale, you can indicate one of your safety barriers is not working, risks are therefore higher in that area of the plant and the decision might mean to not carry out with the intended work program.

Proscient can share information about which pieces of safety equipment are overdue for inspection or maintenance in specific areas.

A company may have a Key Performance Indicator (KPI) saying 95 per cent of its safety critical maintenance and inspections are up-to-date. This may give a false sense of confidence, particularly if the 5 per cent overdue is in one area where you are planning hazardous work. “Reliance on broad brush KPIs is not sufficient. You need to know details of deferrals, and these need to be current and area-specific so the relevant people can make the correct judgements about activities,” Mr. Neill says.

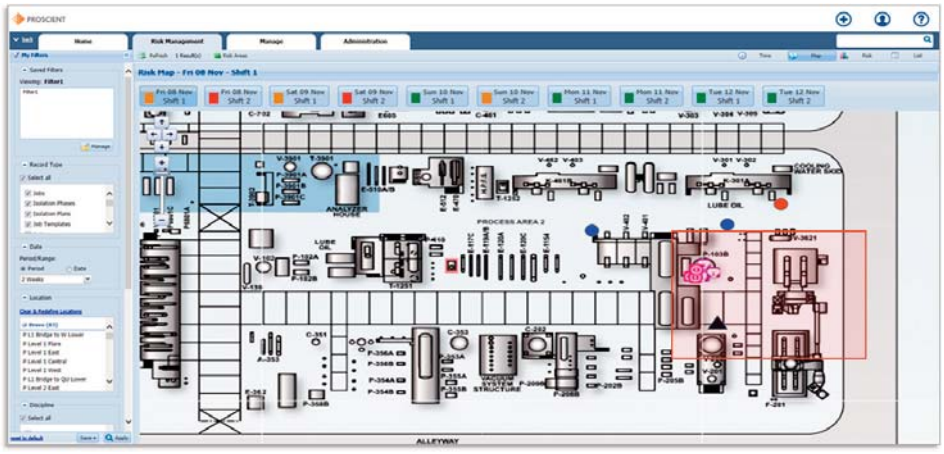
This information can be made available to all staff members through clear visualisations. “We’re trying to bring this stuff together so it is more staring you in the face,” Mr. Neill says.

The software is used by offshore staff to log and monitor anything which is increasing risk from a minimum acceptable level, and this information can then be widely shared, with pictures, showing what is leading to a higher risk and what extra measures should be taken.

“A lot of data tends to be kept by specific experts, perhaps because they think no-one else will understand it,” Mr. Neill says. So one of the things Proscient does is aim to make this easier, creating visualisations for data in real-time.

The software takes all the elevated levels of risk into account and provides an overall assessment, shown with a red traffic light. This can be used as a basis for users to make alterations to the plan, until the software displays amber or green signals, showing the risk potential has reached an acceptable level.

A danger signal might be because (for example) certain high-risk jobs are happening at the same time, in the same place, or a number of concurrent high-risk jobs are working against one another.



Petrotechnics - an easier way to see where you have elevated risks.

Decision-making

Decisions about taking action to reduce risk are relatively complex, when it comes to prioritising one task over another. Priorities have to be made because there is always limited resource. In the case of offshore facilities the constraints can be finite bed space and helicopter seats.

Without a tool like Proscient, the impact on risk of performing one task versus another is difficult to judge so often is given less consideration. Similarly, the consequence of tasks being delayed often results in increasing risk. But this can be difficult to quantify which weakens its priority justification. In the end, it often comes down to who shouts loudest as to what work is prioritised, Mr Neill says.

When it comes to day-of work, frontline decision makers are typically pragmatic. So if they are not made aware of defective barrier systems, they will typically assume all is in good order, unless there are visual indications to the contrary, Mr. Neill says.

Proscient helps support frontline decision makers. For example there is a low pressure drainage system where pitting corrosion has resulted in leaks, yet the leaks have been patched. You could say “that’s a medium-level risk” (in case the patches fail) and “any work within a 20m radius should always have continuous gas monitoring, until the pipework has been replaced.”

Ultimately, decisions need to be made by people not a machine, but the software means that operations decisions are “not made while wearing a blindfold,” he said.

“The system isn’t going to judge what’s safe and what isn’t,” he said. “We’re providing information that allows users to make better, more informed decisions.”

Software

The “Proscient” software has many graphical displays, for example showing a layout of the facility, with icons showing the work which is currently going on, and flags showing where there are weaknesses in some of the barrier systems.

The software is web-based, so the client just needs a PC with a browser or a mobile tablet. It can be hosted by Petrotechnics or by the client. “Offshore on platform you’re never that far from a PC,” he says.

“We’re finding in the US there’s a big push for using mobile solutions. We have dedicated apps that sit on mobile tablets and are user friendly in the field.”

The software can automatically suck data from other software packages such as SAP, Maximo, Primavera, OSIsoft and more.

Petrotechnics

Petrotechnics is mainly focussed on production operations in the oil and gas and petrochemical industries but has recently broken into rail transportation.

The two most recent publicly announced oil and gas contracts were in February 2015, with Nexen agreeing to install the Proscient software on two offshore assets in the North Sea, and in September 2014, with Teekay Petrojarl agreeing to deploy the software on its FPSOs in the North Sea (both UK and Norwegian sectors) and in Brazil.

One major oil company has Petrotechnics’ software installed on all of its upstream assets, and staff say it is “second only to e-mail as the most used piece of software on a facility,” says Mr. Neill.

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Quintiq - helping you optimise planning

Quintiq, a supply chain software company owned by Dassault Systems, has developed a layered software solution for optimising, scheduling and planning the oil and gas industry

The basic idea of computer optimising is simple to understand. Like a chess computer, the computer can quickly evaluate millions of different options, give them all a score, and then present you with the best possible option.

But perhaps what is not very well recognised is how many different industry scenarios the system could be used for – and how much better the computer can be than a human being, and how easy it is to set up.

Many oil, gas and petrochemical planning challenges could be described as 'puzzles' – working out the way to get the highest return on capital investment and enabling planners to make the decisions in line with their particular Key Performance Indicators, Quintiq says.

Altogether, Quintiq has 12,000 users around the world, serving many different industries, including rolled aluminium production, retail, express delivery, rail freight, powder coatings, glass production, steel production and energy.

Examples

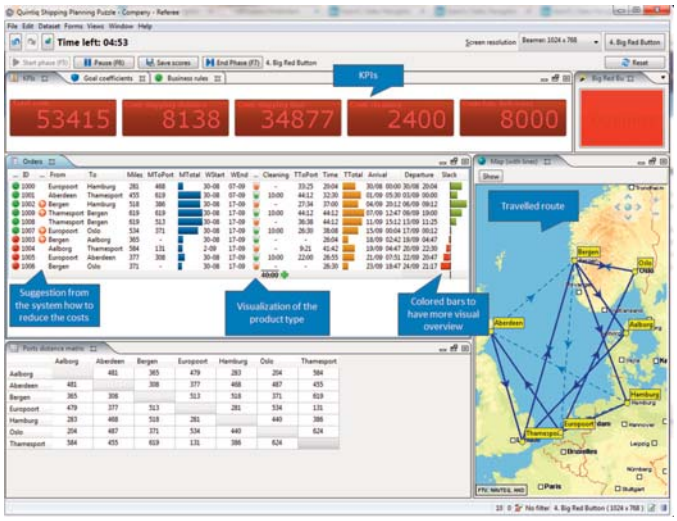
To illustrate the importance of optimization technology, Quintiq presented a simple secondary distribution puzzle at a workshop attended by Digital Energy Journal.

The workshop audience, representing the planner, was asked to work out the optimal routing for six tankers, serving 43 delivery locations from one oil depot, at the lowest cost.

The routing was first worked out manually, which visually looked like a good solution, but after running the optimisation technology, the computer software calculated a solution which could be performed with only 4 tankers (compared to 6) and 8 per cent less miles.

In a second industry example, a vessel scheduler was required to determine the optimal route for picking up and delivering ten vessel cargoes, each with a pick-up and delivery location specific product and time window, with only one vessel. (see screenshot)

There were a number of constraints. Some ports had a specific delivery window which the vessel needed to arrive in, otherwise there would be a penalty. The vessel was carrying a mixture of clean and dirty cargoes, and needed cleaning after carrying a dirty cargo (before carrying a clean one), all entailing cleaning costs and time. There were costs attached to the vessels' time and the vessel's fuel (per distance). There were specific cargoes to be delivered (for example load in Rotterdam, discharge in Oslo).



Quintiq: can you optimise this ten task shipping challenge better than the computer?

The only task the scheduler had to do was determine the optimal route for picking up and delivering the orders to minimize the costs.

Optimising might appear to be a simple task, given that you would want to organise the voyages in a logical order (Rotterdam to Oslo, Oslo to Bergen and so on) and minimise tank washing.

But what was surprising was how much better the optimised solution (by computer) was than the schedule the workshop audience could come up with. The workshop audience created a schedule which cost $40,000 and involved one late delivery; the computer created a schedule which cost $30,000 with everything arriving on time.

A second more complex example was presented for offshore oil and gas operations, where an operator had a list of interventions they wished to make on their offshore platforms, and the usual constraints (availability of vessels, limited anchor slots on the platform, limited bed space). Each intervention would lead to a certain amount of improved production, and had a certain cost (both direct and in terms of down time).

The workshop audience put together a schedule which would generate $800m for the operator. But the computer system managed to make a schedule which would generate $900m.

Moving further, the software could be used to help you maximise your KPI performance for a range of tasks. Using software like this, you can use the KPIs to 'drive' the business decisions - in other words, instead of calculating KPIs after you have done everything, you can organise your work in the way that maximises the KPIs.

The software could be used to help you respond to client last minute requests. For example, in the vessel scheduling example above, if one of the clients says that they really need the delivery as soon as possible, you can ask the optimiser to come up with an optimum schedule taking this constraint in mind. You can see the minimum it will cost to deliver this client's cargo earlier, and then ask the client if they are willing to pay this additional cost.

On the other hand, you might suddenly be offered with a business opportunity (e.g. I need a vessel right now) and you can see how much it would cost to answer it, even if it involves completely rescheduling everything.

You can use it to answer 'what if' questions. For example, if the software is used to plan manning, you can use it to answer questions like, what will be the impact of adding an extra shift?

You might have 'hard' and 'soft' constraints (for example, a 'hard' constraint is something which would increase risk beyond acceptable limits, but a 'soft' constraint could be one which increases costs).

The planner can take all of this into account when working out the optimum schedule, but speed is of the essence when your organisation copes with larger numbers of resources and activities, stressing the importance of aligning human intelligence with innovative technology, hence the theme of the conference.

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