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Time for onshore wireless seismic

David Bamford
Consultant Editor, Digital Energy Journal

Seismic technology is the main, some would say the only, means of interrogating the sub-surface in sufficient detail to allow insightful geological prediction and the precise location of wells.

The technology progresses via much incrementalism, interspersed with a few real breakthroughs.

Given recent and future trends in exploration, what is the technology breakthrough that we most urgently need?

To give some structure to my thoughts, I have been reviewing the hot exploration themes that can be discerned by counting internet news items and interrogating company presentations.

Rough statistics I know but a reasonable guide to what companies are thinking about.

As a result, my 4 hot themes are deepwater, the Arctic, unconventionals and mid-continent offshore.

When one digs into these topics in detail, of course there is a long list of offshore areas that are being explored – Angola, Ghana, Liberia, Sierra Leone, Mauretania; the coast of South America from Guyana to Brazil; the Falkland Islands; west of the Shetlands; Greenland and the Barents Sea; China; and so on.

Equally, one can point to onshore areas – shale gas and shale oil exploration in the USA; Iraq in general and Kurdistan in particular; West and East Siberia; the mid-continent of Africa including the rift system; even northwest England (coal bed methane and shale gas).

So I assert that onshore exploration is growing in importance relative to offshore; and I am going to state quite baldly that onshore exploration technology is miles behind offshore.

Why is that?

The availability of regional or 'exploration' 3D has been the main driver of exploration success in deep water.

Huge swathes of multi-client 3D, covering for example whole 5000 sq km blocks offshore Angola, are available at prices as low as $3000/sq km, are turned around exceedingly rapidly, and are interpreted at great speed.

The technology drivers have been:

Super efficient and effective acquisition systems based on vessels capable of towing many, many streamers and multiple guns.

Simultaneous processing – to some extent on-board – but mainly via satellite transmission.

Powerful interpretation workstations, capable of dealing with these vast surveys and delivering both time and attribute-based interpretations.

As an 'old codger' I would simply point out that this is an incredible transformation from the days of 'postage stamp' surveys in the North Sea that took two years to go from design to delivery of a 'final' product…and then interpretation on paper invariably meant that only 1 line in 10 or maybe 5 was fully interpreted!

Thus, modern 3D lies at the heart of modern offshore exploration, integrating stratigraphy, sedimentology, facies prediction, rock physics, hydrocarbon phase prediction on the regional and prospect scales, and then provides a 'surgical' tool for choosing exploration well locations.

What is more, very complex geological problems, for example at great depth or beneath salt or basalt, can now be tackled, for example by multi-azimuth, wide-azimuth, wide-angle recording.

So much for offshore and deepwater.

It is a fact that such integration is much rarer onshore; 3D plays a much lesser role. Here's an example I heard about the other day: exploration in the Llanos foreland of Colombia where everybody now explores with 3D seismic, leading to success rates as high as 75% - pretty remarkable in an onshore environment.

The terrain is this area is moderately undulating 'cow country', so relatively straightforward for acquiring 3D, and yet the cost per sq km is roughly an order of magnitude, ten times, that of offshore multi-client 3D. So we are talking $25-30,000 per sq km.

Step back into the Llanos fold belt itself, and the cost is more like $100,000 per sq km.

Why so? Why these differences? How can we pay so much!

My contention is that onshore seismic has simply not yet seen the acquisition technology breakthrough that transformed offshore 3D over 15 years ago.

As my old friend Ian Jack has pointed out many times, supported by Bob Heath of iSeis, both at Finding Petroleum events, the absolute key is the slow pace and man-power intensive nature of using cables, and that the first breakthrough we seek is the advent of light-weight, long-life, wireless systems.

What this means is that, in turn, onshore exploration itself remains untransformed, with the exception of the odd example such as that I have quoted from Colombia, Tullow Oil's activities in Uganda, one or two others.

I am fully aware that it would be unreasonable to expect onshore 3D seismic prices to drop to the level of offshore multi-client data, largely because onshore seismic crews have to contend with a variety of terrains and topographies and that significant numbers of people will inevitably be involved in deploying onshore seismic equipment.

A better message than a simplistic 'cheaper please!' is that the cost of onshore 3D needs to be at the point where shooting it extensively - so it can be used for regional and prospect work - fits neatly into the 'gradually focussing your onshore exploration' approach which is actually the topic of our next Finding Petroleum Forum on 15th February.

Thus I await with some excitement a year in which cable-free onshore seismic might finally achieve a breakthrough.

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Tom Halbouty
CIO and CTO, Pioneer Natural Resources

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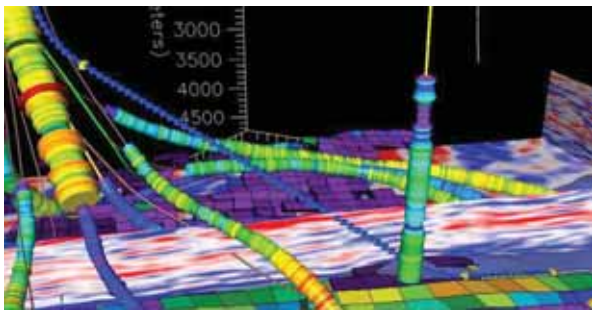


Production

Shell – new technology for onshore seismic

Shell is developing two new technologies for onshore seismic – a new lightweight, low noise wireless sensor together with HP, and a fibre optic recording system, ideal for permanent monitoring, together with PGS

Shell is currently developing two new technologies for onshore seismic recording, to enable denser channel recording and permanent recording over the life of the field, said Wim Walk, manager of Shell's geophysical measurement research and development department, speaking at the Jan 25 Finding Petroleum London forum, "Advances in Seismic".

With HP it is developing a new wireless lightweight wireless sensor. With PGS it is developing a fibre optic land seismic recording system.

"We said, let's see what we can do with these companies and develop partnerships," he said.

The oil industry is tackling more and more complex and smaller reservoirs, and looking for ever higher recovery percentages, all of which means that better seismic data, which can provide a clearer and more accurate understanding of the subsurface, is a great help, he said.

It will help enable exploration in the subsalt plays in the Middle East, of which a significant part is still unlocked" he said.

It will also be a great assistance in unconventional gas operations in North America, where Shell is greatly involved.

"The future reservoirs will have more complex fluid distributions - they'll be harder to detect and to model," he said.

"It all needs a big leap forward in seismic data quality and we need to do something about that," he said. "We need to step up the amount of measurements and add more data to get to where we want to be."

A cost-effective permanent seismic monitoring capability on shore would be very helpful in maximizing recovery, monitoring how oil is being extracted from the reservoir and where it remains in place. "We need to get as much as possible out." he said.

Permanent seismic monitoring can also be used for monitoring carbon dioxide underground storage.

Shell has been looking for new onshore seismic technologies for a number of years, and decided to drive the technology development itself, because it did not see the traditional seismic industry "enthusiastically driving into that direction," he said.

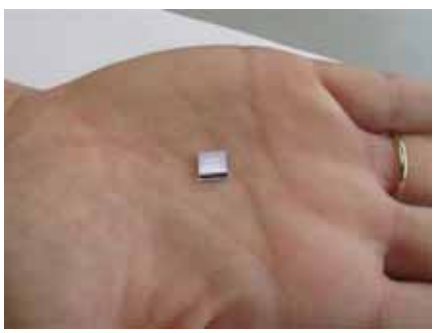
"We decided to take the initiative and said, let's see what can be done."

So far, both the HP and PGS projects are on schedule. The feasibility stages are nearly completed, and modeling has been done of the deployment efforts. Field tests are starting shortly. "Prototypes exist and initial tests confirm they meet the specifications" he said.

Shell is not planning to enter the seismic instrument business itself, and compete with other seismic technology providers. The technology will be developed by PGS and HP, with Shell in the driving seat.

Both HP-Shell and PGS-Shell partnerships plan to invite a traditional seismic provider to partner in the commercialization phase, although there will initially be a period where Shell will have exclusive use of the technology.

"We are not planning to keep the technology to ourselves," he said. "In the end, the whole point is to drive the industry forward in this."



The sensor HP is developing together with Shell has a tiny accelerometer made using nano technology. The smaller it is, the less power it needs, and so the smaller the battery needs to be

Crew size

The biggest limitation on current seismic technology is the crew size. There are limits to how large a seismic crew can practically be. Current seismic crews can already involve 200-300 people and involve 500,000kg of equipment.

"We can't just multiply the system we have by a factor of 10 - we'll have 2000 people out there, that's just not acceptable," he said.

Crews spend most of their time moving equipment, so if you want to get more channels of recording for the same number of crew, you need to reduce the weight of equipment per channel.

Wim Walk, manager of Shell's geophysical measurement research and development department

"We identified two technologies with the potential to increase the channel count but keep the deployment effort essentially the same."

The technologies will ultimately stand or fall by whether they can be feasibly deployed.

Shell has done modeling to see how easily the systems can be deployed, both computer modeling and small scale real modeling with dumb units in the desert," he said. "It can be done if these things are lightweight, with an effort that is the same as we currently make."

Lower frequencies

Being able to shoot and record seismic at lower frequencies would help improve the subsurface understanding.

"Now we're shooting data to 7, 8 Hz and processing it, but we need to move downwards in frequency," he said.

"We know that there will be a huge quality difference if we can go even further. If we can go to as low as 1 Hz that would be phenomenal."

HP

With IT giant HP, Shell is developing a new wireless unit to record, store and transmit seismic data.

The most important component of the unit is a sensor which has a wide bandwidth and dynamic range, low noise, low weight and low power consumption.

Because it has a low power consumption, it does not need such heavy batteries, and because it is wireless, it does not need any cables.

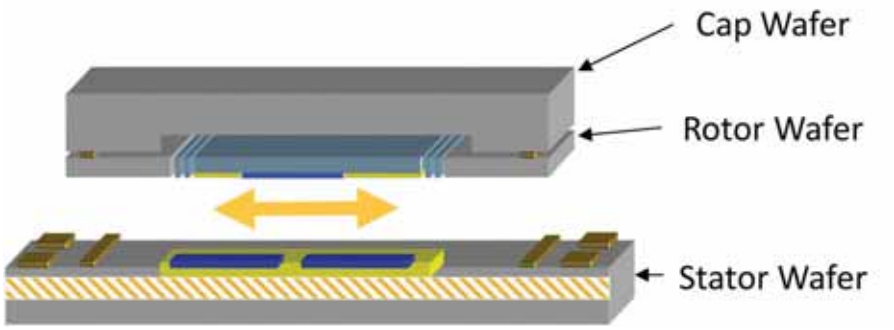
As a result, the weight of equipment which has to be carried out to the field is much reduced, so less manpower is required for the same number of channels. This all makes a much bigger number of channels more feasible.

Shell is aiming to develop a system with HP which can feasibly record a million channels in the field. "Although you don't always have to put out a million channels out there, of course," he said.

The sensor was originally developed for a high density storage device. The sensor is built in HP's Microelectromechanical system (MEMS) technology for HP's ink jet printer heads. Shell found out about it when it invited HP to an internal conference on new developments in nanotechnology.

"When we first saw the MEMS sensor we were not sure that it could serve as a seismic sensor. But there was a program and project to modify the sensor, to see that it actually works," he said.

Prototype of the PGS sensor in a recent field test in Oman



Inside the HP sensor - a moving mass is part of a tiny silicon chip

The sensor is packaged into a unit which includes a sensor, a battery, wireless communications, electronics, and a pin to pin it into the ground. It is strong and lightweight.

Managing a million channels of wireless communications from all the sensors is also a big challenge. "But a company like HP is well positioned to deal with these challenges," he said.

HP has a very different culture to Shell, in particular because it is used to working to much shorter time frames – HP works in time frames of a few months between the latest technology launch, Shell thinks in time frames of decades, he said.

"You have two different business cultures which is both challenging and exciting. So we are very happy with the way things are going," he said. "It's interesting and rewarding how you can synergize both companies' capabilities."

PGS

Shell is working with PGS, to adapt its fibre optic permanent ocean bottom seismic recording technology for use on land.

The sensors do not need any electric power and the fibre optic cable that carries the data from the sensors can be much lighter. This reduces the weight of the total system, which means that it is easier and faster to deploy.

For example, one optical fibre cable could carry 4000 channels, so you can have a seismic line 40km long with sensors every 10 metres. You have a very dense and large system that doesn't need any electric power in the field," he said.

"We have established that it fits the bill in terms of noise, frequency response and weight. This system has very interesting advantages, options and possibilities."

Computer capability

Another important technology development is the growth of computer processing capability.

Until about 2010, the size of a seismic survey was limited by the cost of computer processing capability, he said.

But in 2010, the price of computer processing capability reduced to the point that the limiting factor in size and density of seismic surveys was the number of crew you could deploy in the field and the amount of equipment they could carry.

"We want to re-claim the advantage of this computing capability," he said.

Using neural networks for seismic interpretation

Dr. Tom Smith, founder and former president of seismic interpretation software company Seismic Micro Technology (SMT) has launched Geophysical Insights to help oil and gas companies better understand seismic response data. The company is currently researching and applying Unsupervised Neural Networks, which have shown strong promise in initial test cases

When working with seismic data, interpreters identify different "attributes" from the data, such as coherence, azimuth, instantaneous amplitude, response phase and instantaneous bandwidth.

The attributes are then used to analyze the seismic response for subsurface conditions.

Making inferences from just a few attributes is challenging, but extracting significance from 30 attributes simultaneously requires a completely different approach.

Making the interpretation process more challenging, seismic interpreters often develop their own idea of subsurface conditions and look for data which supports this idea – like a detective following a hunch.

Dr. Tom Smith and others have been researching the application of Unsupervised Neural Networks to interpret multiple attributes simultaneously and are confident of the effectiveness of the technology. The methodology is showing tremendous promise in identifying subsurface 'anomalies', which can be the presences of hydrocarbons.

After much iteration, the software application converges on general patterns in the data. If the seismic attributes have consistent relationships, this indicates that the consistency of the subsurface in that region is roughly the same. Anomalies identify subsurface regions where the neurons (neural network analysis) cluster around those conditions that are distinctly different than the surrounding material.

Since the data is processed in a completely unbiased way, there is less risk that important reservoirs could be missed because people are following the wrong hunches.

For the rest of the subsurface volume, where the seismic attributes lack consistent relationships, a human interpreter can analyze those regions more closely.

The interpreter can also do analysis that the software can't do such as apply knowledge of petroleum geology to determine the presence of hydrocarbons. In this way Unsupervised Neural Networks are another tool among many for seismic interpretation.

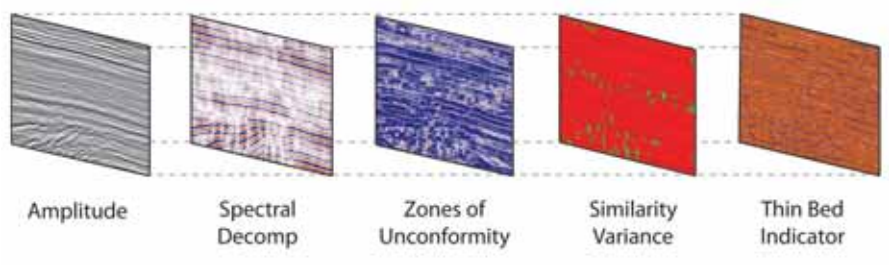


Figure 1: Typical seismic attributes

To illustrate what attributes are, figure 1 below shows just five typical attributes; however, sometimes as many as 30 different attributes from the same block of seismic data will be available, all in three dimensions.

Making it simpler

"When we combine say three attributes, it gets very difficult for the interpreter to juggle all those numbers mentally," says Dr. Smith.

"Once we have more than three, the human mind has a difficulty appreciating the subtle nuances and information is lost."

It is normal for seismic interpreters to work with 20-50 different attributes.

"You have subtle nuances of combinations of attributes which are not appreciated by the human being, particularly when all of those attributes are in 3D. While some of the attributes may be redundant or unimportant, we can't simply elect to eliminate attributes without understanding their collective meaning to the interpretation," he says.

"There may be combinations of attributes that we cannot initially appreciate. The neural networks reveal subtle combinations in the data that we may not initially appreciate. The technology presents results in a low-dimensionality space that can be utilized by the human interpreter.

"We cannot replace the interpreter in the process, but we can equip the interpreter with tools that take fuller advantage of all the seismic response data. We believe the best technology for rendering the data in the most usable form is unsupervised neural networks."

Unsupervised Neural Networks

The term 'neural network' in the field of artificial intelligence means taking a complex problem down to simple relationships and understanding it from there.

It is called a neural network because the human brain operates in a similar manner. We achieve complex things, but it is all done by single neurons sending information between each other.

Dr. Smith cites some examples from nature. "For example, you can understand how a flock of birds fly by just understanding that each bird wants to fly in the same direction as the bird close to it, and keep fairly close, but not so close that it collides. Or in the case of Geese flying in a V formation, each goose wants to keep behind the bird in front, while remaining just to the left or right of it.

"This is simple so far – but with many birds in a flock each individually following these rules, you end up with something which looks extremely complex – a flock of birds flying across the sky."

"Another example of neural network programming is in optical character recognition. A great deal of computer processing is involved in machine reading text or handwriting, but it is done by doing a simple task many times over – looking at each character, working out which way the line goes, and comparing that to a database of different characters to see which one makes the best match.

"In the field of seismic interpretation, the neural network tools can simplify a complex set of seismic data and seismic attrib-

Finding Petroleum

London

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April 20, 2011

Subsurface data and the digital oilfield

Can you find more oil and gas by looking harder at your existing subsurface data, rather than commissioning new surveys?

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Continuing our series of digital oilfield conferences, this event is aimed at subsurface data managers, IT managers and geophysicists who want to learn about new ways and new ideas for getting more out of their subsurface data, using the combined expertise of the IT, geophysics and data management disciplines.

Chaired by David Bamford, ex head of exploration and head of geophysics with BP.

Delegates registered include SASOL, Oracle, BP and Centrica.

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Other Upcoming Finding Petroleum Events

- Technologies to potentially help avoid another Macondo
  Tuesday, May 17, 2011
  The Geological Society, Free
- Digital Oilfield IT infrastructure
  Thursday, June 02, 2011
  Hallam Conference Centre, £300
- Exploration technology and business - focus on unconventionals
  Tuesday, September 20, 2011
  The Geological Society, Free

Speakers

Mohannad Aftab
Manager Applications and Knowledge Manager
OMV
Using GIS (geographical information systems) to manage spatial data, including subsurface maps.

John Williams
BP
What RESQML can do

Keith R Holdaway
SAS Global Oil and Gas
Statistical analysis of data streams in real time - as used by oil majors on their reservoirs

Duncan Irving
Senior Analyst, Oil and Gas
Teradata
Making subsurface data storage and computing fit for purpose

Richard Cooper
CEO
Offshore Hydrocarbon Mapping
Integrating seismic, well and CSEM data

Jane Wheelwright
Technical Application Specialist
Dynamic Graphics
Integrating subsurface data stored in different packages

Ed Evans
Co-Founder and Managing Director
New Digital Business
Controlling the geotechnical applications portfolio

Jill Lewis
Managing director
Troika International and Society of Exploration Geophysicists
New position standards from seismic surveys - and how it helps you make your seismic data work harder

Nick Pillar
Ikon Science
Assessing probability your seismic interpretations are accurate

Håkon Rueslåtten
Business development manager
Numerical Rocks
Analysing drill cuttings to get a better understanding of the subsurface

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utes by distilling it down to simple relationships between one set and another set, and processing that many times over. Rather than write a grandiose algorithm, you can do processing of many pieces of data at a simple level."

Illustrating the application of Unsupervised Neural Networks, Figures 2 and 3 below compare a conventional seismic interpretation to one using the new technology.

Figure 1 is seismic data for an existing gas field being developed by Auburn Energy in Wharton County, Texas. The image is comprised of seismic reflection data and fault interpretation using conventional, commercially available software.

In Figure 3, the original data are replaced with Neural Network analysis by Geophysical Insights, which has been based on the simultaneous analysis of 13 seismic attributes. Figure 3 reveals two likely locations (in white) of hydrocarbons.

The processing requires only a high-end laptop computer or equivalent, as it is only processing 20 sets of 3D volumes of data at fairly low resolution, even if the volume is many cubic kilometers. Processing time is typically 1 to 8 hours. It can require large data storage, which is inexpensive today. "I've got 8 TB of data storage that easily contains the seismic data we typically use," Dr. Smith says.

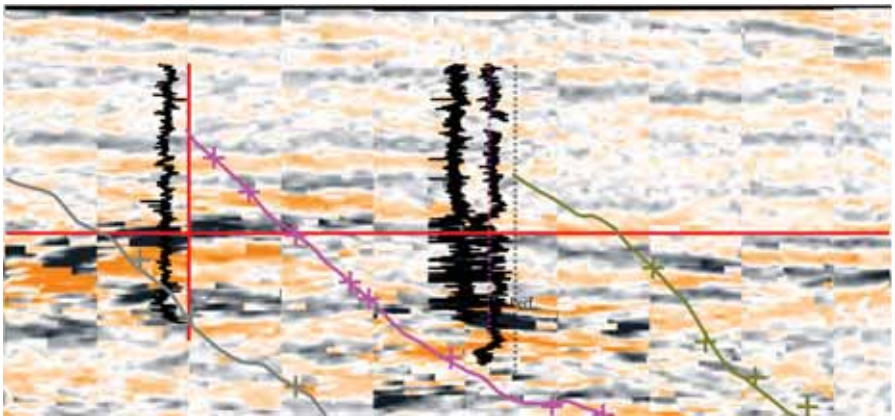

Figure 2: Section using conventional seismic interpretation software. Courtesy of Auburn Energy

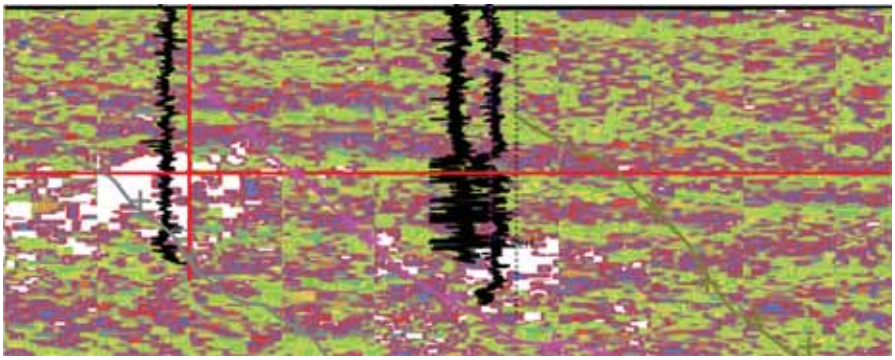

Figure 3: Section using Neural Network analysis. Courtesy of Auburn Energy

Geophysical Insights

www.geoinsights.com

Dr. Smith investigated the unsupervised neural networks and became so excited about the possibilities that he decided to launch Geophysical Insights in 2009 to apply the technology to Oil & Gas exploration and production. The new company is engaged in research, consulting and training of geosciences teams at oil and gas operating companies.

"Having devoted a couple of years to researching the technology, I'm now almost an evangelist for applying these methods in our industry," he says. "I am convinced that this is a tool that can dramatically reduce the time and risk of exploration."

Offshore safety

Dr. Smith believes that the same technology could also be used to help improve offshore safety and equipment reliability. If all of the data from an offshore facility is put through an unsupervised neural network that analyzes it for clusters, the software it could give a simple indication if everything is OK (running normally), or there are anomalies worthy of further investigation. This could provide warning of potential anomalous conditions before there is an incident or excursion, providing more time for analysis and, if necessary, corrective action.

Data recorders on platforms

Oilteams, an oil and gas software company in Milan, believes that there could be a business providing marine style voyage data recorders, or 'black boxes' for offshore oil and gas operations, to continually record what is going on, including sound recordings (to record what people said to each other) and instrumentation data.

The system does not store every piece of data in perpetuity, but is designed to delete data which is older of a certain age, so after any incident you can always retrieve data for the previous (for example) 48 hours or more depending on storage availability. The instrumentation data can also be archived for operational purposes or streamed real-time to remote locations. All data is also synchronized in time and can be replayed for investigation, operational and training purposes.

Enrico Saperdi, managing director of OilTeams, notes that in the Macondo case, recordings of what people said to each other in the hour before the rig was evacuated could have been helpful in the investigation.

It is also possible to record data from equipment. Some automation systems are tricky to connect to a data recorder, but it is usually possible with some effort and assistance from the system manufacturer.

The company is working together with Rutter Technologies of Canada, a company which has developed and marketed some 4000 voyage data recorders for the deep sea maritime industry - ships were required to install them over the past decade.

"It looks logical to us that the oil and gas offshore industry can use the experience accumulated in other sectors, mainly in the naval and commercial marine industries, making a similar effort to ensure that incident investigators can have the necessary information," he says. "This can help to avoid future incidents, reaching an higher level of safety and reducing risks for the environment.

Oracle – helping you answer critical business questions

Imagine having a software tool, running on your iPad, which can predict the impact of what a well intervention will have on the overall business. This is what Oracle is trying to enable, says the company's oil and gas industry lead Hossam Farid

Imagine having a computer system which can easily help you answer questions such as, what is happening right now, what is the impact of what I am about to do, how will doing this intervention change the company's overall portfolio, or what does this change in the oil price mean for all of the projects currently on the drawing board.

Oracle is trying to help companies re-architect their systems to answer questions like these, said Hossam Farid, vice president and global oil and gas lead with software giant Oracle, speaking at the Dec 9th Digital Energy Journal conference in London, titled "Collaboration and the Digital Oilfield."

Companies may already have the necessary data stored somewhere deep in their systems. They may also have the applications and tools capable of computing the answers, but they lack what is needed in between – the agility to capture, condition and move the data from various sources to the business management applications, in timely manner to optimise business performance or to respond to an urgent demand. "Isn't that what the Digital Oil Field Initiatives were all about in the first place?" asks Mr. Farid.

"The current state of information stores, application solutions, and field infrastructure are aligned with traditional functional requirements they were designed for, but don't necessarily integrate to provide broader perspective of full asset management," he said.

This often led to the common complaint that "people have direct access to only 20 per cent of the data they require to effectively complete their tasks, while the rest is owned by someone else and difficult to obtain."

Software as a barrier

"Oil and gas companies are increasingly finding out that the best gusher to discover after oil is data. There is certainly no shortage of desire for information by people working in the industry, nor there is shortage of data – So are software systems and collaboration platforms the real obstacles?" he asked.

"Many software solution providers are to blame," he said, "In their bid to retain customers and protect their own competitive advantages, they designed their solutions using proprietary technology that kept them closed."

"Over the last two decades, development tools and new approaches to architecture have presented numerous pilots around digital initiatives. Those pilots have uncovered, however, one common theme revolving around the quality and completeness of the local information management solutions and the difficulty in integrating new solutions into legacy applications and work processes," he said.

"It is undoubtedly the responsibility of IT solution providers to make it more open and easy to use."

Point to point integrations

"Point-to-Point is the most commonly used approach to applications integration, which in turn made systems susceptible to the incremental evolution to complex environments of inter-application connections," he said. "In such scenario, it's not uncommon for the scale and complexity of the interconnections to become barriers to the deployment of new business solutions," he added.

"The most crippling factor is that in many cases not all the dependencies are well known or well documented, which ultimately leads to situations where the architecture becomes inflexible."

"And although each system continues to function separately, changes to any component can have unpredictable consequences on other steps in the business process."

The iPad

Meanwhile, Mr Farid believes that the success of the iPad is a demonstration of what collaboration tools can do when the right standards are introduced, and how the market can drive and reward those standards.

Similar to many popular applications that run on smart devices like iPad, iPhone and BlackBerry today – consider an oil and gas industry app capable of presenting information about a specific well, including current and historical production information, data from the well logs, core samples, workovers and complementary information about the subsurface which the well intersects. Now combine that with risk calculators, forecast capabilities and approval workflows. Similarly, consider a role-specific app serving up information for each discipline as required without the need to constantly worry about security or about the underlying infrastructure.

The iPad is demonstrating to people what a good digital oilfield system should look like for the end user, says Hossam Farid, vice president and global oil and gas lead with Oracle

And finally consider an app that is completely designed and built by the very same user who will eventually use it, on the very same platform he uses every day. "Isn't that the idea of Cloud Computing we all dreamt of?" he asked.

"The future is those little applications running on smart devices, only focusing on the function that you are responsible for, but capable of accessing and computing 100% of the data you require to effectively complete your tasks."

"This is the future of applications and collaboration tools, where the user is taking back the control. The market is simply going to dictate the standards - a message we are hearing loud and clear."

Digital Energy Journal December 9 conference report

Standards

"In the past, standards were often confused for regulations, and many considered standards as hindrance for innovation. There is even still a minority who see open standards as a threat to their job security, or organizational power".

But, the iPhone / iPad phenomenon showed how the market rewards open standards, he said.

Companies now see standards as the foundation for optimising their business. It is becoming more and more acceptable to look into standards, and soon will become the only way to attract younger talents to the industry, he added.

"Such game changers compelled us in Oracle to look beyond the automation tools of field operations, and to invest in building the necessary open architectures that enable the fusion of applications and tools on smart devices, communicate with other data sources on similar or different platforms," he said. "We are serious about how the market is going to dictate the standards and we are ready when the industry transitions into the standards-based architectures."

Mr Farid believes that Oracle differentiates itself by creating open integration platforms and data management tools that adheres to industry standards such as PPDM, PRODML, WITSML and others.

IT as a service

There is no doubt that transformation into services will be the natural evolution of the IT industry. "We have seen it in the banking sector, the telecommunication and the utilities industries. 50 years ago when you built or bought a new house, you needed to pay for extending a new power cable, arrange for adjusting and balancing the load, ensure constant supply and follow up for correct billing. Today, you just pay for a service and in many cases you don't even know who generates that power, who transmits it, how they balance the load or eliminate outages. You simply pay a billing company."

Meanwhile, a large complex operation is happening behind the scene, from upgrading the grid, collecting data about household consumption, aggregating it with local and regional data to ensure that the national grid can provide enough power for all, then sharing it with transmission units for balancing the load, and finally segmenting it for billing.

"I think this is the natural evolution of the IT infrastructure and it will be tough for those who are still stuck in closed architectures and proprietary systems" he said.

Business drivers

According to BP's Deepwater Horizon Accident Investigation Report, on September, 2010, "Indications of an influx with an increase in drill pipe pressure are discernable in real-time data from approximately 40 minutes before the rig crew took action to control the well. The rig crew did not recognize the influx and did not act to control the well until hydrocarbons had passed through the BOP and into the riser."

"The recent Macondo disaster was undoubtedly another game changer that stressed the needs for better collaboration tools equipped with artificial intelligence and built based on open standards," Mr. Farid said.

Where to start?

Oracle focuses on transforming organizations into Information-Driven Enterprises, by increasing the reliability, speed and breadth of data collection, analysis, and decision making "simply integrating tools and capabilities," he said.

"We focus on connecting stakeholders to timely, accurate, and actionable information which fulfils the following conditions.

"The criteria are that information should be:

"Trusted and Reliable – information must be available when needed, latency destroys the ability to act quickly to business events

"Secure – access must be secure and confidential information must be protected.

"At Lower Cost – reduce the cost of managing information so that savings can be directed towards strategic initiatives."

Oracle solution is built based on new and existing IT platforms. It focuses on leveraging real-time and near-real time data to improve both, short term operational performance and long term reserve recovery.

"One of the biggest challenges that Digital Oil Field projects have faced is integrating the different types of data in use within the organization," he said.

"Structured, unstructured and real-time data have completely different nature and use. The volume and speed of real-time data captured from sensors and SCADA systems are completely different from intervention and workover related data."

"Marrying those different types of data, as well as accounting for unstructured formats of maps, drawings and other documents is a colossal task."

Oracle is trying to resolve the complexity and simplify the task by offering a middleware architecture which can serve as an intermediate layer between the data sources and the business management tools that turns the data into meaningful information.

Oracle's Digital Oilfield Solution consists of a master data hub and integration tools that takes a snapshot of the data from various sources, uses a standard data model, such as PPDM model (developed by the Professional Petroleum Data Management Association) to condition it, and serve it up ready to business management tools. Oracle Site Hub also leverages spatial technology to reference all data and transactions to GIS coordinates to facilitate the usage of maps.

The solution also includes a complex event processor to handle real-time data streamed directly from sensors and SCADA systems, analyse it in comparison with historical data to spot trends, and finally reacts based on a form of artificial intelligence stored in the rules engine. This enables sending alerts to the business management tools, or kicking off various business processes.

Oracle also bundled multi-dimensional analytical, risk management and business process management tools to the solution to create an end-to-end collaborative work environment and to accelerate the realization of value.

"Our goal is to increase productivity by eliminating manual oilfield activities; improve the decision making process by integrating financial, technical and operational KPI's with risk management and collaboration tools; reduce costs by establishing a reusable platform that can be deployed quickly in new operations or projects; and improve the management of knowledge and the establishment of best practices across organizational and geographical domains."

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Microsoft – making computing environment simpler

Microsoft has a mission to help oil and gas companies make their computing architecture simpler, and put it together in a standard way

The Microsoft Oil and Gas team has embarked on a project to help the oil and gas industry simplify its computing environments, said Paul Nguyen, industry technology strategist for oil and gas at Microsoft, speaking at the Digital Energy Journal conference in London on Dec 9, "Collaboration and the Digital Oilfield".

A simplified computing environment will cost less to build, be easier to use, easier to maintain, easier for newcomers to the oil company to understand, and companies can get a wider choice of which software companies they work with after the system is built.

Employees will have a "dashboard" type application providing all the information necessary for them to do their role, such as managing drilling or production.

The current IT infrastructure most oil and gas companies have is often unable to cope with the enormous recent increase in data going through the systems, Mr Nguyen said.

For example, every time a company installs a fibre optic cable to an offshore platform to replace a satellite link, people find much more data that they want to send back to shore.

"How do you consume that? You can't use the existing same traditional way of processing that," he said. "We need things like automated workflow to handle the data volume."

Microsoft has oil and gas business in more than 70 countries. It has had a dedicated oil and gas team since 2002, but has been serving the oil and gas industry for over 30 years.

Standard architecture

An important step at simplifying the computing environment is encouraging all oil and gas companies to put together their IT architecture in a standard way.

To try to encourage this, Microsoft formally launched its standard IT architecture project, called "Microsoft Upstream Reference Architecture (MURA) Initiative", in June 2010, following a number of discussions it had held with different software companies during early 2010, including oilfield software providers Landmark Graphics and Schlumberger, and system integrators Accenture, Infosys and Wipro Technologies.

Now there are 29 companies involved.

"We were exploring the idea: what if we work together as an industry and come up with this common architecture?" he said.

The architecture is intended to continuously evolve as new technologies and best practises emerge.

Having a standard architecture should help companies reduce overall costs of their IT, particularly when it makes it much quicker and easier to install software from different vendors.

The standard architecture won't specify which vendors to use – the idea is that different vendors can provide all of the different components and compete against each other, and the customer can choose, and everything will be interoperable.

Oil companies will probably end up working with many different software companies in a mesh, rather than using gigantic software systems provided by the same software company, as many of them do now.

There will be no need for anyone to write any integrations between different software packages – everything will work together straight away, just like consumer IT does.

This will encourage a competitive environment in the software industry, something oil companies particularly like, he said. Software companies can compete to create tools which give better capabilities to their users.

There has been a recent change in the attitudes of oil operators over the past few years, in that they are getting less tolerant of companies who want to try to lock them into their software, he said.

The actual architecture is "fairly generic" he said, with data layers, integration services, business processing tools, and a presentation layer.

There will be cloud-type cluster of PCs which can serve people the data they need. It could be operated by the oil company or by a third party.

Microsoft is working closely with oil and gas standards body Energistics on the project, with monthly meetings to talk about what is most important in order to deliver a "highly interoperable environment," he said.

A simplified computing environment will cost less to build, be easier to use, easier to maintain, easier for newcomers to the oil company to understand, says Paul Nguyen, industry technology strategist for oil and gas at Microsoft

Survey

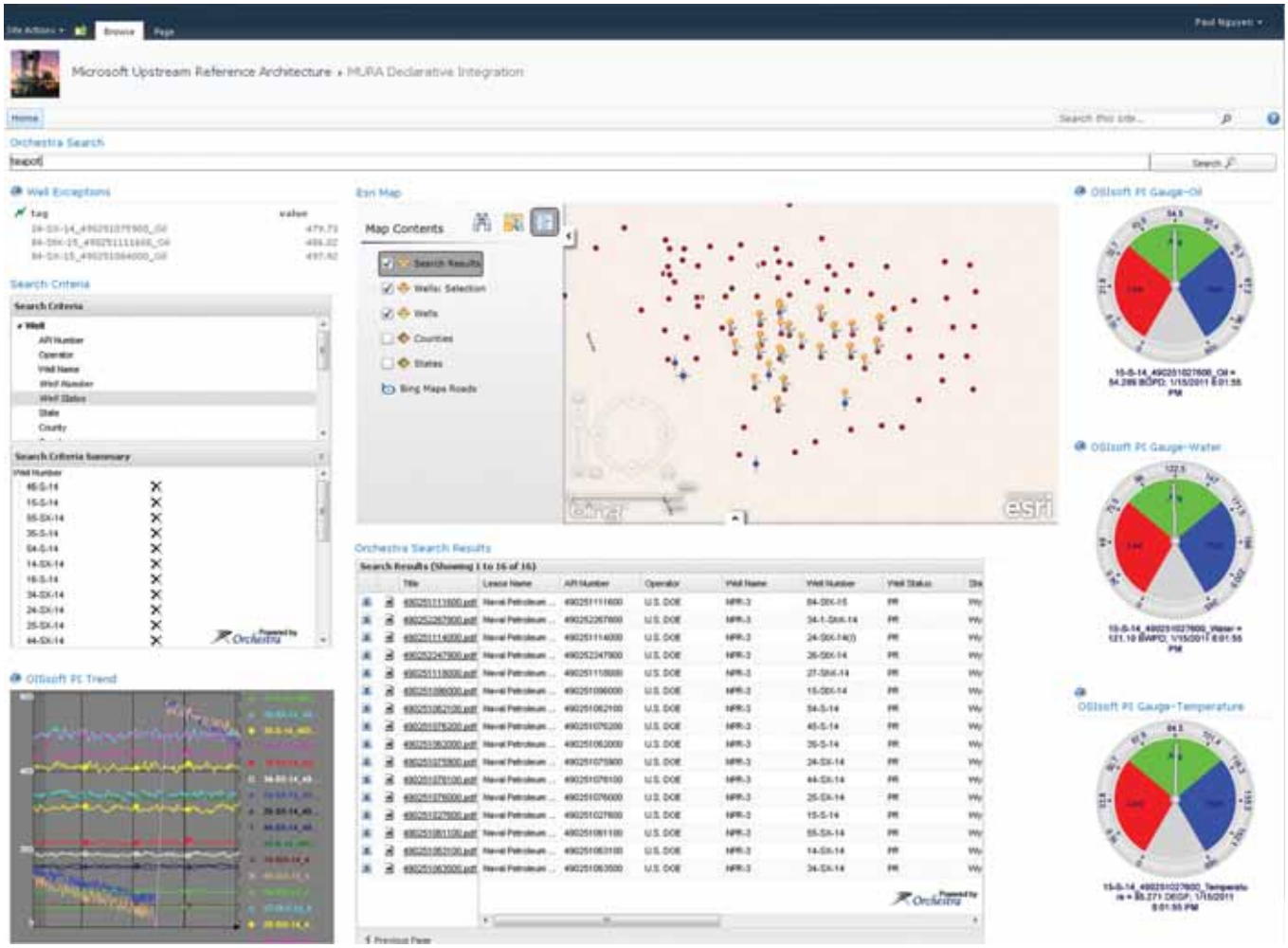
In August 2010, Microsoft and Accenture co-sponsored a survey about oil and gas computing trends.

People were asked, "who do you see as most capable of creating a simpler and more unified computing environment across the upstream oil and gas sector?"

13 per cent said they thought it was upstream operating companies; 15 per cent said industry IT standards organisations; 18 per cent said IT product and service providers; 19 per cent said oilfield product and service providers; and 35 per cent said an industry wide collaboration of all of the above.

When asked which IT standard technologies will help improve efficiency in computing, 57 per cent said more extensive upstream industry standards (WITSML, PRODML); 57 per cent said SOA approach; 30 per cent said cloud computing; and 30 per cent said social media.

However not so many companies are



Microsoft's declarative integration concept: build a software tool showing the information an individual in a specific role needs to do their job

actually using these technologies – for example, only 24 per cent of people said they were using upstream IT standards such as WITSML and PRODML.

Top down and bottom up

To make it all work, you need to look at the system from both a top down and bottom up approach, he said.

Senior IT management can look at the entire company from the 'top down', and see what kind of IT services are required, and what needs to be brought together to create it.

For example, if a company is putting together a drilling and production optimisation solution, they might be gathering real time data from OSIsoft, and use surveillance tools from Schlumberger, some planning components from Landmark Graphics, and maybe their own algorithms. The top down approach is looking at 'what sort of facility we need to provide'.

At the same time, a bottom up approach is needed, gradually connecting together the data infrastructure, so it can deliver data to where it is needed, or looking at ways to make software applications easier to 'wire up'.

3 bottom up concepts

Microsoft is looking at three different 'bottom up' concepts.

The first is called "declarative integration," which means making it easier for software tools to be adjusted by the people who use them, rather than programmers.

For example, if someone in an asset management team has a change to their role, which means they need different information on their main portal, this can be created without any new coding – users can do it themselves.

A second concept is making it easier for people to put together dashboards using maps. There is an increasing trend for map based navigation in applications, he said. This geospatial component is inherently the same within various applications, making it easier to compose these types of solutions.

The third concept is "event aggregation", where "events" (such as a piece of data being updated) can be shared from one computer across to other geotechnical software tools like SeisWorks and Petrel, or shared across the whole company. OpenSpirit has tools to make event aggregation work between different geotechnical software tools.

To make all of this work you need a range of different IT infrastructure 'services' embedded – for example Esri, which helps manage map-based systems, and PointCross, which can 'orchestrate' different services together.

"The idea is that all of these components will drop into this canvas," he said.

Energistics – more information in public domain means better collaboration

Energistics' goal for 2011 is to expand collaboration opportunities for standards development , said COO Jerry Hubbard

The 2011 goal of oil and gas standards body Energistics is to make more information about its standards development process available in the public domain through our website, rather than only available to active members on its collaboration site, said COO Jerry Hubbard, speaking at the December 9 Digital Energy Journal conference "Collaboration and the Digital Oilfield".

"For standards to work, they need to be freely available for use and for review during the development phase," he said.

"If you develop standards in a proprietary fashion they have no business value," he said. "You have to have them widely adopted to get the return on investment. That's the only way we'll see the benefit and the wider adoption."

Energistics has many working groups developing various aspects of its standards, who use an online collaboration tool based on Microsoft Sharepoint, where they can place documents and exchange information.

Energistics wants to be able to bring more of this information available on its website so that anybody can use it, and also emphasise how open the organisation is.

Energistics currently has 11 energy companies (oil and gas operators) as members, and 100 others, including all the major oilfield service companies and many regulatory agencies.

The organisation is 20 years old, and was named POSC until 2006.

Energistics is structured geographically around 8 global regions: Africa, Asia Pacific, Eastern Europe including former Soviet Union countries, Latin America, Middle East, North America, South Asia and Western Europe. In each region, people have been given the role of promoting Energistics there.

The biggest web traffic on the Energistics website is from the US, followed by UK, India, China and Russia, Canada and Norway, France, Australia and Germany, he said.

A few years ago, Energistics realised that there was no point in developing standards if no-one was using them – it would need to encourage the use of the standards as part of its core mission.

Getting vendors involved

It has been proving hard to convince many vendors to embed the standards in their products, even if their customers, the oil companies, are demanding that they do, Mr Hubbard said.

"It sounds like a good idea if you have an energy company that says 'you will use WITSML' but that's not as easy as it seems with the vendors. You have to have a commitment from everybody."

Many software companies believe that by adopting standards they can lose their competitive advantage, and if they really believe that, then it is hard to argue with them. "We can't step on anyone's competitive advantage," he said.

"But at the same time, any where we can standardise that doesn't step on someone's competitive advantage is a plus to the industry."

One example of an oil company which is doing well with digital technology is Pioneer Natural Resources, Mr Hubbard said. "They are very involved in developing standards at Energistics and very involved in adopting the standards. They are finding open standards very useful in building operational efficiencies.

Getting users involved

There is also a push to get the people who actually use the software products involved in development of the standards.

Until now, standards development has been done by IT people from oil companies and product development people from vendors.

Energistics is trying to develop an 'operators' group' – people who will use the standard, so they don't get left out of the process.

Business value

Finding a way to quantify the benefits of developing a standard, with a calculation method everyone agrees on, is difficult.

"We have to have a way to measure the business value of what we've done," he said. "I don't think we've settled on a singular way to say, we've brought a value to this particular process."

For standards to work, they must be freely available for use - Jerry Hubbard, COO at Energistics

Many of the benefits are very intangible, such as making it easier for products developed for one company to be used at another, and giving oil companies more choice as to which products they use.

If everybody uses a data exchange standard, it also means they have consistent ways of labelling the data – consistent schema structures, naming conventions and patterns, he said.

WITSML

WITSML is Energistics' most well known standard, for exchanging data associated with drilling.

It is now embedded in 40 different software products. "Many organizations don't even know they are using it as it is transparent to them," he said. "All of the major oilfield service companies have embedded the standards in their products."

However most people only use a small part of it – there are more aspects of the standard, known as 'data objects' which are not being widely used. "We're trying to communicate to the industry what's out there and what's available," he said.

There are 51 companies involved in the WITSML special interest group (SIG), with a number of different committees having a number of different meetings every month.

The company built a new 'object' called StimJob, covering data associated with fracturing jobs, which will be included in WITSML 1.4.1, the next release. It was also released as a stand-alone standard in December 2010.

Energistics is also looking at extending WITSML to include drilling automation standards, working with the International Association of Drilling Contractors (IADC).

The earlier versions of WITSML have proven to be not tightly enough defined to be certain that one WITSML –compliant software package can communicate with another. A number of slightly different versions emerged, which are referred to as 'dialects'.

Many software companies have configured the standards in their products in a manner that slightly changes the functionality. While still 'WITSML compliant' their products are not interoperable with other software vendors' products.

This is something which Energistics is aiming to address with the next release of the standard, 1.4.1, which is defined much more tightly. "That's one of the issues we are struggling with," he said.

PRODML

PRODML is probably the second most well known standard, covering data associated with optimising production. It is currently being commercialised with large service companies.

Version 2.1 of PRODML is on track for release in the second quarter of 2011, and will include objects for communicating data from wireline formation testing and facilities, he said.

RESQML

RESQML is a project to develop a standard to communicate reservoir data. It builds on the work by an organisation called RESCUE, which had no relationship with Energistics until 1.5 years ago, when the RESCUE group asked Energistics if it could take over the standard, with RESCUE becoming a special interest group at Energistics.

Version 1.0 of RESQML was released in January 2011.

Geophysics

There is a geophysics special interest group in Energistics which was re-invigorated in 2008, following efforts and funding from India's oil company ONGC. It is looking at standards for data exchange about seismic velocity.

Here any standards developed will ultimately be handed onto the Society of Exploration Geophysicists (SEG), because it already manages a number of standards related to seismic data.

"They won't be our standards, they will be SEG standards, we'll be handing them to SEG for review."

Energistics is working together with the International Association of Oil and Gas Producers (OGP), which develops standards for position information in seismic data.

National data repositories

Energistics is helping develop standards for National Data Repositories (NDR). These are data stores which governments maintain, with information about their oil and gas seismic surveys, reserves, drilling and production.

The NDR standards are based in WITSML and PRODML, the existing Energistics standards for drilling and production data.

Around 100-150 people are expected at the next 3 day meeting of the National Data Repositories group, in Rio de Janeiro in March 2011.

EnergyML

ENERGY ML is a concept that started about 2 years ago, to try to link together PRODML, WITSML and RESQML. "We thought there was a better way to go about this in terms of how we connect the dots," he said. "We're trying to bring a broader spectrum of these standards – and to have connectivity end to end."

"So you can use the same dictionary for WITSML and PRODML. The same schemas will be used. That's a work in progress right now."

DOF: devil is in the details

The key to getting a digital oilfield project working is detailed planning, says Julian Pickering, director of Digital Oilfield Solutions Ltd

Every reader of Digital Energy Journal knows that digital technology can help make well planning and drilling operations much more efficient, with better collaboration, things getting done faster, better understanding of risks, better decision making, better response time and more likelihood of hitting the payzone.

But you can't just show your management a PowerPoint slide saying that, and expect them to greenlight a digital oilfield project, said Julian Pickering, director of Digital Oilfield Solutions and previously head of digital technology for drilling and completions with BP, at the Dec 9 Digital Energy Journal conference.

Management expect a detailed understanding of what the project will earn for them.

They want to know how much work it will take to get the project implemented – particularly if it involves redefining people's roles.

For example, will there be people who suddenly have to work closely with teams halfway around the world, something they have never done before?

Will there be people who usually live most of their lives on a plane, who suddenly find they have to spend more time at home, communicating electronically?

Will there be staff who find that their responsibilities have increased from looking after one or two wells locally to looking after hundreds of wells remotely?

"There's a whole raft of things that need to be put in place," he said.

But once you have a detailed understanding of what the benefits and barriers will be, "you're in a position to do implementation, scope and requirements," he said. "You've got the project up and running."

Not enough preparation

A common problem is that people rush in to deploy a solution and skip all the preparatory work which needs to be done.

This means that many digital oilfield projects meet a great deal of resistance from employees who are affected by them. "I can't believe there's anyone who hasn't met some element of resistance."

To get around this, you need to do more preparatory work. "We've got to get some input from the people who are going to use the technology," he said.

"The business needs to decide what it

actually wants, instead of drifting to the idea that it would be good to implement digital oilfield technology."

"The important people to influence are the people who will be working with the technology," he said. "Some engineers equate their influence to the specific knowledge that they have and with this type of thinking they can be reluctant to collaborate."

"So there is an important exercise in making people comfortable with knowledge sharing and helping them to recognise that this enables them to use their knowledge more effectively."

"Don't just go straight in and say 'as of March 1st you'll be sitting in a wonderful new collaborative environment'."

Dr Pickering said he has visited a few companies which have invested large amounts of money on collaboration centres which are only used as "glorified meeting rooms".

Collaboration centres must not be technology showcases – they must be demanded by the business and support operational workflows. This will usually require new business processes."

"Don't go and build exotic collaboration centres unless you've done your homework first."

Many people have become frustrated with digital oilfield projects because they have not delivered to promises.

"Perhaps in many ways digital technology has been oversold," he said. "Is digital oilfield the answer to all the oil and gas problems that we have? I think the answer to that is no."

"We have to paint a realistic picture so that people understand what it can deliver."

Assessing value

All the time, it is important to calculate what business value the project will actually provide, taking into consideration how it changes the risk profile, the effort needed to get the business using the new technology ("business alignment") and the success factors.

"It's amazing how many large projects do very little in terms of assessing business value and so how do you know whether they have been a success?" he said.

It is far more engaging if those people who will need to put effort into the project also get something out of it. Just influencing the overall company bottom line feels very remote. "Most projects in oil and gas are very large and involve many stakeholders. We need to create a win-win environment," he said.

"You can't have a process where one company is making all the money whilst another contributor is losing out. The business value process needs to be thought about in the widest possible sense."

Meeting today's challenges

Many people need better digital oilfield technologies just to meet their needs today.

"The way oil and gas companies operate is changing," he said. "Decisions have to be made very much in real time. We have to make decisions as wells are being drilled."

"We need to become increasingly collaborative. The industry is now truly international and faces challenges to work across geographical boundaries, multiple languages and diverse cultures."

"We've actually got a shortage of experts, which has been talked about widely."

"This is creating new demands. Increasingly experts are required to interact with operations not by being there but through IT technology. They are looking at real time data far more and interacting remotely with site personnel. This is a very different way of working."

"We are making increasingly large demands on digital technology to make that happen."

As offshore drilling operates in deeper and deeper water this will introduce greater technical challenges and will be "a catalyst to improve uptake of digital technology," he said.

Connectivity

One of the easiest ways to convince people that digital oilfield is a good idea is to enable better connectivity between different systems in different places.

Most people accept that hardware and software for their home and office PCs connects together easily. So why is it that connecting digital oilfield hardware and software together is often so complicated?

"This must change. End users will not be willing to tolerate a lack of connectivity," he said. "It is not reasonable to expect an end user to buy one device from a vendor and thereafter be committed to buying everything else from that same vendor just to ensure connectivity." This is a critical area that is being addressed by data standards in the oil and gas industry.

IT risks

You need to ensure that the IT is secure and that people will believe it is secure. If a system creates new IT security risks, that will "negate a lot of the value statements that you're putting forward," he said.

This doesn't just mean hacking, it can also mean people being fed incorrect information and making decisions on it, not knowing that it is incorrect.

Don't just drift towards a digital oilfield - the business must decide what it actually wants, says Julian Pickering, director of Digital Oilfield Solutions Ltd

Also, people will become very dependent on the new data streams, which means that rapidly they will become business critical. If the data becomes unavailable for any length of time operations can be severely hampered.

Pushed by vendors?

There is still a large perception that a lot of the drive for digital oilfield technology is coming from vendors, he said.

"I approach a lot of exploration and production departments and it feels as though you're a second hand car dealer trying to flog them a dodgy motor."

We are still some way in E&P from the importance of digital technology and automation being recognised. In contrast, there are other industries where it has become the normal way of working, frequently driven by business pressures. "In the automotive industry, for example, no-one builds a standard production car at western labour rates without robots and plant automation - it would not be economic," he said.

"When you actually think about the degree to which digital technology has embedded itself in the medical, automotive and space industries, they don't even have specialist conferences on digital technology because it is part of normal business," he said. "We are still talking about DOF as though it is something slightly different from routine oil and gas operations."

"We want to get to the point where we don't talk about DOF as a separate subject, we just talk about oil and gas operations and digital technology is an enabling component," he said. "Most of us would agree that DOF is not embedded as much as it should be."

Drillers need better data – Kongsberg

Torbjørn Forthun, managing director of Kongsberg Drilling Management Solutions, believes that drilling contractors need access to better data – and then they need to use it

"A drill crew today is more or less the same crew that has been there since 1950, said Torbjørn Forthun, CEO of Kongsberg Drilling Management Solutions (previously Odfjell Consulting), speaking at the December 9 Digital Energy Journal conference "Collaboration and the Digital Oilfield."

"It hasn't been changed at all. Neither have the work processes."

"Drilling speeds haven't increased in the past 40 years, while non productive time has actually increased, yet there is so much technology on the market which can help."

Drilling companies do not gain any reward if they drill faster, so they don't ask that question.

"It would be very nice for the drillers to have technology to see things in a 3D or 4D perspective."

"But the problems for the drilling contractors are actually not these issues, it is actually to have relevant information at all times."

"Real time data is important to the driller himself, but for his crew on the drillfloor and people involved in next day planning onshore, – it is more right time data. If you sort out right type of data for a driller, that is maybe the biggest issue in order to prevent [accidents]," he said.

Reading the investigation reports from the Macondo disaster, the "industry has been caught with its pants down," he said. "It's nothing more than that. It's a lack of use of good technology in terms of integrating information and sharing plans between the parties involved in the drilling operations."

Mr Forthun was involved in some of the drilling industry's early plans to develop integrated operations, working at Odfjell Drilling in 2003. He helped Odfjell become one of the leading drilling contractors on the Norwegian continental shelf in use of integrated operations, he said, working together with many different oil companies.

His group, formerly known as Odfjell Consulting but now acquired by Kongsberg, provides a software tool called RigManager, which enables people from all disciplines involved in drilling a well at the drilling company, together with the drilling departments in oil companies, to share as much information as possible.

3 generations of IO

There have been three generations of integrated operations so far in Norway.

The first generation – videoconference between shore and the rig – had "limited operational impact really", he said.

The second generation was building sophisticated integrated operations rooms. "The management like to take people to see these environments. It looks fancy but it doesn't impress me, unless you change the way you actually do the operations," he said.

In one generation B room, a company manager offshore said he would permit people onshore to listen and watch meetings from their collaboration rooms, but not to join in the conversation. "They didn't want any influence from onshore," he said.

The third generation is when people actually change the way they work, where the onshore team proactively help the offshore team prepare their operation for next day and make their lives easier.

"The crew offshore can focus on staying on the drill floor and perform on the drill floor. They are not supposed to sit in their offices and work with their spreadsheets."

"The onshore team ensures that there are no outstanding maintenance tasks for critical equipment – they are on top of it."

"HSE is improving because of the onshore awareness," he said.

"[Offshore personnel] can focus on operations issues. "The operational cost is extremely affected by this – especially on the logistics side."

Areas of difficulty

One of the biggest difficulties with integrated operation projects is getting service companies involved, when they are already tied into tight contracts with oil companies, which leave little room for trying new things out.

"These companies work on fixed contracts and they have to deliver on these contracts," he said. "They say, we don't have time to do these changes, we don't have time to stop operations, we can't do piloting all the time on our operations. The demand for delivering on a corporate level is too high," he said.

Another source of tension is between the software engineers and the rig crew. The rig crew can't believe that a software engineer can help him to better drilling, and the software engineer doesn't believe that the rig crew understand him.

With Macondo.. the industry has been caught with its pants down" - Torbjørn Forthun, CEO of Kongsberg Drilling Management Solutions

You also meet people who were recruited into senior management from working on the drill floor, who have learned what they know from experience. These people can be less likely to believe that there can be better ways of doing things. "They say, we know what we do and we've been doing it like this for 30 years," he said.

"It's not that they're not willing to change but you have to speak their language to make them understand," he said.

There are still very low levels of standardisation in oil and gas IT, he said. One oil major has 36 different drilling operations, and only 2 of them have the same drilling software. "The North Sea has been a laboratory for new inventions."

"But elsewhere in the world, some oil companies are saying, they want to install new software, but just choose the best of whatever is available and standardise on that.

Norway has a general policy to encourage integrated operations, following a government study showing the potential savings.

But there has also been a fight-back from some people, who don't believe it and think it is a waste of time.

"It is very easy to say, 'I don't believe in IO,'" he said. "You don't have to understand it to say it – you can just say it."

Helping drillers and geophysicists talk

The most common tool for sharing information between drilling and geophysics teams is still PowerPoint, says Jane Wheelwright of Dynamic Graphics Ltd.

The most common tool for geophysics teams and drilling teams to share data with each other is PowerPoint, said Jane Wheelwright, technical application specialist with Dynamic Graphics, talking at the December 9 Digital Energy Journal conference "collaboration and the digital oilfield".

Very few companies have integrated software systems which would enable drilling and geophysics personnel to work directly on the same data.

The drilling and subsurface teams "traditionally don't communicate," she said. "Data is sent iteratively back and forth between the groups. It can take months to plan a well."

The subsurface community pick targets and send them to the drillers; the drillers plan a drillable trajectory, and send their plan back to the subsurface community for appraisal. This is then reassessed in terms of additional subsurface data and returned to the drillers and the cycle begins again.

It would be much better if drillers and subsurface personnel could share their actual data. "Users say it can save up to 90 per cent of the time traditionally spent," she said.

"To me it makes a lot of sense to integrate this data. But in reality it is very rare for this to happen."

"We'll never be able to see our reservoirs. You can't peel back the earth and look at them. You can't ever truly visualise them. So it's imperative that we use all the data that we have available," she said.

But unfortunately most of the raw data is hard to move out of the software packages in which it resides – and because geophysicists and drillers use different software, that means that the only time data is exchanged is screenshots of the software sent as PowerPoint slides, she said.

The fact that there is so much money in the oil and gas industry can mean people don't make the initial effort required to implement new systems which can provide a long term benefit. "There hasn't always been the incentive to do things in the most efficient way," she said.

If data from both drilling and geophysical systems could be used in the same covisualized environment, it could highlight new things about the subsurface, or inconsistencies between the data could highlight where there are potential problems within the reservoir. "It gives more confidence in well positioning in terms of hitting targets and collision avoidance," she said.

Drillers also generate a lot of data about the subsurface while they are drilling, which could be fed back into the geophysics models and used to update them.

Software tool

Dynamic Graphics has developed the software packages "WellArchitect" and "CoViz 4D", which bring subsurface data out of both drilling and geophysics software packages into a tool both groups can work on simultaneously, for planning, drilling and managing drilling surveys. "Data can be brought from a myriad of software packages into the same area," she said.

At one oil major, a group of 24 people was trained to use the 4D visualisation system, including reservoir engineers, geologists, geophysicists, data managers, well planners and drillers.

"All the information is used and everybody has access to it," she said.

"It is easy to use – and the easier it is to use, the easier it is to understand, "she said. "It promotes increased communication between the well planning team and the subsurface community. It removes the brick wall for collaboration and sharing. It gives the results of all the packages to the entire community "It can be picked up and used rarely or on a day to day basis."

"It has to work in Windows and Linux, and be something that different groups can all use effectively."

"The drillers I'm working with are really keen to have the seismic, have any information because they feel that enhances what they can do and gives them more control in terms of how they plan the well. Otherwise they haven't got a lot of control."

The system means that people can work with data generated from other packages without investing in their expensive software and learning how to use it. For example, a reservoir engineer can work with a seismic volume.

"A lot of users, particularly in the reservoir engineering world, will use it in preference to their own systems – they can load data very quickly and see what they want from it," she said.

The software can demonstrate all geocellular data, seismic data, all the targets, all the hazards, faults, and "any other information that can be incorporated as part of the well planning process," she said.

Drilling and subsurface teams traditionally don't communicate - Jane Wheelwright, technical application specialist with Dynamic Graphics

Using a covisualized system, you can see the drilling slot, the targets, data from any offset wells (including well logs), seismic amplitudes, geology and reservoir simulation data, for example.

You can also see the data which changes over time, such as the well status, production, how the simulation model changes and the varying levels of gas or water.

You can view the unswept area at any moment in time, where there is oil which hasn't been produced yet. You can see your planned well path going through the different targets.

The system can show up useful inconsistencies. For example in one well which was about to be drilled, the software superimposed data from two different files, which made it clear that there was a mismatch between the depth both files took as depth = zero. This was due to a Kelly bushing adjustment not being made on a simulation model.

"The well could have been drilled on the basis of information from a simulation grid. But without a cross check against this data, it wouldn't have been picked up until it was too late," she said.

Finding Petroleum

2011 Calendar of Events

Advances in Exploration Technology
Tuesday, February 15, 2011
The Geological Society - Free

Improving Recovery from Existing Fields
Wednesday, March 16, 2011
The Geological Society - Free

Subsurface data and the digital oilfield
Wednesday, April 20, 2011
Hallam Conference Centre - £300

Technologies to potentially help avoid another Macondo
Tuesday, May 17, 2011
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Digital Oilfield IT infrastructure
Thursday, June 02, 2011
Hallam Conference Centre - £300

Exploration technology and business - focus on unconventionals
Tuesday, September 20, 2011
The Geological Society - Free

People and the digital oilfield
Thursday, October 20, 2011
Hallam Conference Centre - £300

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Wednesday, November 09, 2011
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Collaboration and the digital oilfield
Thursday, December 01, 2011
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The Geological Society - Free

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Epsis: effective collaborative work processes by sharing information, not by moving data

You don't have to wait for comprehensive systems for sharing data to start effective collaboration; you may start with building effective collaborative work processes by combining and sharing information (as screenshots), suggests Jan-Erik Nordtvedt, CEO of Epsis of Norway

Norwegian software company Epsis has successfully helped many oil companies integrate their work processes – but mainly by helping them combine and share software applications, not the underlying raw data, said Jan-Erik Nordvedt, CEO of Epsis, speaking at the December 9 Digital Energy Journal conference in London.

The company builds systems where companies can combine and share the screenshots of several software tools, so people can effectively collaborate from geographically dispersed locations and across organizational boundaries. Its clients include FMC Technologies, M-I Swaco, Aker Solutions and Chevron, which has a license to use its products worldwide.

Common data integration challenges

To settle for a system which just shares screenshots, not the underlying data, you have to admit that building a system to share data around the company is just too complicated a task.

Too right, says Mr Nordvedt. Building a system to gather all corporate data into one standardised system is almost too complex a problem to comprehend.

Which business should embark on a project without knowing how long it will take? "You need to know how far it is to the other end so you can be sure you're taking the right medicine. And you might lose some flexibility once it's built."

"We might be over emphasising the data management pieces," he said.

"As far as we can see, data integration is often complicated and reduces the opportunity for end users to be involved," he said.

"Data integration is frequently seen as an absolutely necessity for cross company collaboration. We don't think that needs to be the case. We have an alternative approach based on enabling work processes."

There is no doubt that a system to share data across the company is the best idea over the long term, the question is whether people should solely rely on this when it is so hard to do at the moment.

Mr Nordvedt has been working with integrated operations for 10 years. [sharing data across the company] is not an easy problem," he said. "It's hard enough to do it within the company. It is even harder when multiple companies are involved."

There are many challenges with sharing data between systems, including different data historians (systems for storing real time data), different tag structures, different data formats and firewalls. Not to mention any legal aspects.

Integrating various software tools

Until it is possible to share underlying data around the company, perhaps it would be better just to focus on sharing and combining screenshots of the software tools required for a specific work process.

By sharing just pixels rather than the underlying data, you can build systems which achieve the desired objectives, such as enabling external experts to provide a contribution to rig operations. It may also enable the transfer of specific tasks away from the platform so it can be done in an onshore support center.

Many companies might be reluctant to share raw data with experts from outside the company, but feel more comfortable with sharing screen images, he said.

The large screens in collaboration centres can be used to visually integrate information (including video streams) from many different software applications at once.

If you just build systems to share software screenshots, it can be much easier than building a system to share the underlying data, says Jan-Erik Nordtvedt, CEO of Epsis of Norway

People can integrate the different data feeds together in their heads, rather than by seeing all the data together in one application.

With so many different software packages in use in the industry, it is much easier if you can settle for just sharing screenshots, rather than try to build systems to share the underlying data.

Within a company there can be 20-40 different applications for each engineering discipline.

It is often impossible to reduce the number of different applications, because they are all needed for specific tasks. "You need that specialist application there to make

You can watch online videos of all the presentations at our December 9 conference "collaboration and the digital oilfield" at www.bit.ly/fvQAk6
or see all our past videos in the 'past events' section on www.findingpetroleum.com

that decision," he said.

There have been many efforts to build 'portal' solutions to try to connect the applications together, but these can restrict flexibility. "Whenever there is a change – and unfortunately the response from the subsurface is changing all the time – there needs to be a change in the portal too, so it's often a never-ending story," he said.

"You will not get away from the problem of a large number of applications".

A second problem which almost all assets have is difficulty finding information. "It's really hard to find the information you need when you need it. Very often, what you'll find is what's going to be put in the decision making process. This may depend on who's on duty, so it's very hard to get consistency.

In many cases, the data they are using is coming from a spreadsheet that is private to that specific individual.

Building effective work processes

Epsis has built software systems which orchestrates work processes.

Many work processes in our industry are repetitive and described in company specific guiding documents. This means that for a specific step in a work process, the gathering of information from the same different software solutions is required each time, regardless of who is working there at the time. Epsis has build solutions that automatically start all the required applications pre-loaded with the relevant data. It places these live applications side by side on the screen in the collaboration room and allows for the sharing of the screen with team members at other locations. It is also possible to give the remote participants the control of the local applications.

M-I SWACO example

For M-I SWACO, Epsis built a solution for the company to share data with participants and subject matter experts about their projects, who can be sitting anywhere around the world, including at the customer oil company.

The only piece of data which is flowing (as data) is the drilling data; but all the information from the software tools can be shared as screenshots. The company head office in Houston and drilling centre in Stavanger can be effectively involved as required.

"They are not doing a massive data integration work – they are using the collaboration solution to achieve the same thing," he said.

The workflow system is built up to do a specific corporate task – not the other way around, when the data is connected together in the hope that it will make it easier to do the work.

ShipServ: finding the best suppliers

Maritime and offshore e-marketplace ShipServ has developed tools to help marine purchasers learn more about suppliers they are considering doing business with

Maritime and offshore e-marketplace ShipServ, has developed new services to help marine purchasers learn more about new suppliers they are considering doing business with.

A purchaser looking for spare parts for products from a certain manufacturer will soon be able to see if the supplier has been verified by that manufacturer and is authorised to sell genuine spare parts.

The purchaser can already see which other marine purchasers that supplier has transacted with recently, either the full name of the purchasing company, or the name in general terms (such as 'a ship management company in Germany').

The purchaser can also see reviews from other purchasers who have actually transacted with that supplier.

All of this should help improve confidence in electronic commerce – a lack of trust between trading partners is usually one of the biggest obstacles to online trading - if a buyer is asked to transact with a supplier they don't know at all, just on the basis of a low quote.

"We're building mechanisms where trustworthy suppliers can float to the top," says ShipServ CEO Paul Østergaard.

Marine purchasers often have to find new suppliers, to provide a new product in a new port, and don't have time to investigate them fully. This service should speed the process up.

$1.7bn transactions

The total volume of supplies traded over ShipServ during 2010 was worth $1.7bn, with 4 million transactions (which includes requests for quotation, purchase orders and order confirmations), a 31 per cent increase compared to 2009.

ShipServ currently has 155 shipowners and 36,000 suppliers on the system.

New shipowners signing up with the company in 2010 included ABCmaritime, Alpha Shipmanagement, BW Gas, Chellaram Shipping, Mowinckel Ship Management, OSM Ship Management, Pacific Basin, Prestige Cruise, Reederei F. Laeisz, SeaCor Dubai, Regent Seven Seas Cruises, Star Cruises, Tai Chong Cheang Steamship, Tolani Shipping and Wah Kwong.

Paul Østergaard, ShipServ CEO

The company claims that it now has 24 per cent of world's cruise ship capacity connected to the network; 40 per cent of container carrying capacity and 43 per cent of world's LNG fleet. Shipowners connected to the network put on average 80 per cent of all of their shipboard purchasing requirements through the network.

The company is also expanding into the offshore and oil and gas industry. Offshore companies using the system include DOF, REM Offshore, RK Offshore Management, SeaCor, Solstad Shipping, TideWater Marine, Vroon Offshore Services.

Merseyside Ship Stores

Merseyside Ship Stores, one of the largest suppliers to UK vessels (including providing 40 per cent of supplies to offshore vessels in Aberdeen), currently takes around 30 per cent of its orders through ShipServ, says director of sales Ulfar Norddahl.

80 per cent of all its enquiries are converted into orders, he said, despite the fact that most purchasing managers send requests for quotes to three different suppliers.

The company aims to be a top quality supplier, providing only top quality products, and ShipServ's reviews and ratings provide an objective means to telling this to the market, he says.

"Good clean business is what we're promoting, and ShipServ is the best way for shipowners to have good clean business. It's a guarantee that you're dealing with good people."

Making your company fit the DOF

When an oil company adopts the digital oilfield (DOF), it can mean changing some of the compay existing work processes. Dutch Holland explains how this can happen

When an upstream organization decides to "go for it" to maximize the use of digital technology for business value, the enterprise's architecture, i.e., its moving parts, must be altered and configured specifically for digital technology.

When an upstream company decides to make digital oilfield (DOF) exploitation a higher priority for the enterprise, myriad work processes in the operations side of the business must be seen as process maps that can be the basis of DOF success.

Operations? What does operations have to do with DOF? Isn't this a "technology play?"

Not really. DOF is a Business Improvement play exploiting digital technology.

The business focus of DOF puts the ultimate responsibility squarely in the court of the business' operations side.

Unfortunately, many organizations have assumed that DOF means the ball is in technology's court. The net result of this assumption has been easy to spot: technical success but business failure.

DOF architecture

Let's go back to the beginning. In the first of this article series, DOF Enterprise Architecture (DOF EA) was described as a combination of three different structures that must be aligned and integrated to maximize the business potential of digital technology.

Strategic Business Architecture - including the company's DOF vision and strategic goals, measures and incentives

Work Process Architecture - including the matrix of technical and business work processes needed to achieve DOF strategic goals

Technical Process Architecture - including the processes inside the IT or R&D organization to manage digital resources

Work Process Architecture

Work Processes are the steps organization members take to do the company's work.

Included are the technical steps associated with production engineering as well as what may be called the business steps of "making economic decisions about production."

Day-in/day-out completion of these many steps moves an organization toward its business goals.

The heart of any DOF strategy is to improve these processes by enabling them with digital technology.

But, first, a powerful and robust work process architecture is needed.

Five organizational elements must be aligned by senior managers to get DOF into full play: **Work process maps, integrated metrics, aligned organization and incentives, Business Improvement Opportunity development processes and a Business Readiness methodology**.

Work process maps

There must be a comprehensive map of core processes is in place. Want to know where to place that well? Wouldn't a map be important?

Similarly, if you want to use digital technology to improve upstream operations, start with a map of myriad work processes comprising upstream business operations.

Smart mapping with the right level of detail in the most potentially fruitful parts of the work process map is the goal, not infinitely detailed workflows. And work process mapping must comprehend all three kinds of upstream processes because pots at the end of the rainbow will likely come from all three processes types:

Value-added processes … sometimes called physical processes that drill holes and move product through pipes

Management processes … frequently called decision processes that product orders and directions for running the upstream operation

Enabling processes … frequently omitted from DOF discussion altogether, such as supply chain.

Integrated metrics

You need integrated goals with metrics are used across work processes. Heard the old saying, "If you can't measure it, you can't manage it."? That's still true.

Unfortunately, many have taken that to mean dollar (revenue and/or cost) "Measurement by organization, by department or by individual producer."

Not only are these not the kinds of measures needed, they frequently get in the way of metrics actually needed for exploiting DOF.

"Measure it to manage it" goes even further. Without measures on process steps as well as on process outcomes, it is impossible to do any kind of in-depth analysis for generating and evaluating the potential of Business Improvement Opportunities. Without metrics, operations will not be able to generate performance targets that would allow technologists to identify and select digital solutions.

It's not enough to build a DOF to fit the company - sometimes the company has to change to work better with a DOF, says Dr Dutch Holland, Holland Management Coaching

Aligned organisation and incentives

Aligned structure, roles and incentives are in place and in use around integrated goals and work processes. Key to making a DOF strategy is an organization structure on the operations side that puts a senior manager on point to leverage digital technology for upstream. More than just an appointment, this job should be given to "a comer," one of the top two or three senior managers in line for movement even further up the organizational chain.

In addition, all asset managers must have key performance indicators and incentive structures focusing some of their prime time on supporting DOF initiatives. Every manager in operations is in a position to identify potential business improvement opportunities (BIOs).

In addition, all managers must clearly understand their charter to lead their part of the organization to business readiness when a business improvement, enabled by digital technology, will be implemented with their personnel.

Business Improvement Opportunity

A proven method for targeting and developing business improvement opportunities (BIOs) and requirements must be is in place.

This is it: the bullseye, the engine, the process that develops the organization's "battle plan" for improvement.

No amount of digital technology will be useful if not used on the most critical (or fruitful) business opportunities.

Unfortunately, those BIOs with the most potential don't self-identify but must be dug out of mapped processes.

The general idea is that every work process and every step in every process has a "digital economic potential,"an assessment of how productive it would be, in ROI terms, to invest in a digital solution.

The only way a BIO development process will work is with valid and robust BIO selection methodologies, experienced operations leaders and appropriate subject matter experts from both the operations side and the technology side, all focused on work process maps.

Work Process Maps	Integrated goals and metrics	Structure, roles, KPIs, incentives	BIO target and develop process	Business Readiness Process	Ready for Optimal Results
	Integrated goals and metrics	Structure, roles, KPI's, incentives	BIO target and develop process	Business Readiness Process	No ability to see or drive BIOs
Work Process Maps		Structure, roles, KPI's, incentives	BIO target and develop process	Business Readiness Process	Silo points of view; suboptimize
Work Process Maps	Integrated goals and metrics		BIO target and develop process	Business Readiness Process	No energy to work for BIO results
Work Process Maps	Integrated goals and metrics	Structure, roles, KPI's, incentives		Business Readiness Process s	No focus, no battle plan, min results
Work Process Maps	Integrated goals and metrics	Structure, roles, KPI's, incentives	BIO target and develop process		Technical Success and Business Failure

If you don't have all the components in place (cols 1-5) you get problems (col 6)

Business readiness

You need a Robust Business Readiness implementation method (for processes, technology and people) including comprehensive risk management.

Despite almost two decades of "doing it wrong," many companies implementing new IT still depend on the one-big-technical-project approach, with tons of technical support and almost no business support, which practically guarantees a "technical success but a business failure."

For a DOF implementation to have a real chance to do any good at all, there should be two adequately staffed and resourced interdependent projects ongoing simultaneously:

Technology Readiness Project … to get the technology Ready for the organization

Business Readiness Project … to get the business Ready to use the technology

Critical to the success of this two project approach is the right ownership, leadership and accountability. The Business Readiness Project can only be owned and led by the senior management of the business' operations side. Period. The Technology Readiness Project can be owned and led by senior management of the Technology organization.

All or Nothing

Fail to complete one category of work process architecture and the end result will be greatly disappointing from both an operational and economic point of view.

Future Vision

The future Vision for DOF is bright for companies recognizing that the key to success, the heart and soul of the digital strategy, can only reside inside an operations side of the business that is committed to growth using digital technology as a key means.

More information

This is the third article in a five-part series that defines and explores the ways an upstream organization would need to be re-configured to fully leverage the use of digital technology to improve the business. This article puts the responsibility for exploiting digital technology squarely in the court of the operations organization.

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Plans for Offshore Europe

Attendees to Aberdeen's Offshore Europe event in September 6-8 this year can expect discussions on North Sea taxation, reducing CO2 from oil and gas operations, new risk profiles and transparency of risk, says Samir Brikho, CEO of engineering giant AMEC and chairman of the conference

The Offshore Europe conference and exhibition, which claims to be the largest oil and gas event outside North America, is likely to include extensive discussions about meeting future UK energy demands and reducing carbon dioxide emissions, says Samir Brikho, CEO of engineering giant AMEC and chairman of the conference.

In particular, it will look at the future demand at a consumer level of electricity and hydrocarbons; how changing North Sea taxation levels could increase North Sea investment; how a tendency by independent oil and gas companies to outsource more activities could change the risk profile different companies are under; ways to make risks more transparent; making carbon capture and storage finally happen; and reducing CO2 emissions of upstream operations.

Many of these topics have been under discussion for many years, so the focus will be on getting things done, rather than just discussing them, he said.

AMEC is a company which knows how to get jobs done. It provides consultancy, engineering and project management services in oil, nuclear, renewables water and related sectors, employing 23,000 people.

Mr Brikho is not shy about talking about renewables. AMEC's power division has seen its revenues from conventional power station engineering drop in recent years, as environmental concerns have made new plant construction much more difficult. But these revenues have been replaced by growing revenues from renewables, including biofuels.

Meeting energy demand

The biggest question for the UK energy industry is how the UK's energy demands will be satisfied over the coming decades.

"Any power installation has a lifetime of 30-40 years," he said. "Today's power generation is a result of decisions made 30-40 years ago. It is very crucial to think very hard about how and what we install now."

The industry will be under much more pressure in coming decades, as it is expected to make more energy available with fewer resources. It will have to become much more efficient, which will require "much better alignment between operators, service providers, consumers and government," he said.

In order to satisfy public environmental concerns about oil and gas and enable new projects to be built, the oil and gas industry needs to be better at telling its story, he said.

The industry will also need to consider if there will be changes in the mix of energy demand between electricity and consumer use of gas and oil, as electricity is increasingly used for transportation and heating.

Encouraging North Sea production

If the UK is to provide more oil and gas, then it is important to maximise production from the North Sea and access its remaining estimated 30 billion barrels.

Here there are concerns about how North Sea operations are increasingly run by independent oil companies rather than oil majors, and how changing the tax regime would make it different.

"When it comes to mature assets, the oil majors jump off at a certain stage and sell it to someone else," he said.

North Sea operators are currently charged 50 per cent tax on their oil and gas sales. This is low compared to some parts of the world, where it is 95 per cent. But the question is, if investment would increase if the taxation level was reduced. "We believe it would," he said.

On the subject of nuclear industry, there is a need for a more evolved industrial supply chain in the UK, with the small companies and expertise to make it work, but the business is not yet large enough to support it.

Operating models

The industry is also gradually changing its operating models, with a growing role and responsibility for contractors, particularly when serving independent oil and gas companies, he said. There will be a panel session about this.

For example, many independent oil and gas companies have a much lower number of employees per well than the oil majors, but rely much more on contractors for their operations.

This could mean that the contractors are more deeply involved in an operation, and their risk profile changes.

Samir Brikho, CEO of engineering giant AMEC and chairman of the Offshore Europe conference

It is very important that everybody has a thorough understanding of the risks they are undertaking.

Following the Deepwater Horizon disaster, Mr Brikho believes that there will be much more questions about the roles the different organisations play in drilling, and what liabilities they take, and where the risks are.

"It is a wake up call for the industry," he said. "But we need to get on top of these things and not be a victim of these things."

"I think responsibility will be more transparent in the future. You need to understand the risks behind it," he said.

Carbon dioxide

Concerns around the world about climate change are staying fairly constant, as you can see by looking up the term 'climate change' on google.com/trends he said.

Reducing carbon dioxide emissions is "most likely to happen in the supply end, not the consumer end," he said.

By converting an old inefficient coal fired plant to a modern efficient gas plant, you can reduce carbon emissions per kilojoule by 70 per cent, he said. "The more we understand gas, we see it is a great fuel for calorific value and emissions."

On the subject of carbon capture and storage, there has still been very little progress in the UK despite many years of talking. But people are also not very clear about how much money they can make from it.

There will be discussions at Offshore Europe about how the upstream oil and gas industry will reduce the carbon dioxide emissions of their operations.

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Enabling e-discovery can help personnel dig for data. Many approaches can meet the challenge, and while no one approach is the "magic" way, attendees to this conference will hear real-world best practices and implementations from those companies leading the efforts to knock down data and information management barriers that confront our industry – seismic, G&G, well, field, production and reservoir data and information. It's all about making quality data driven decisions.

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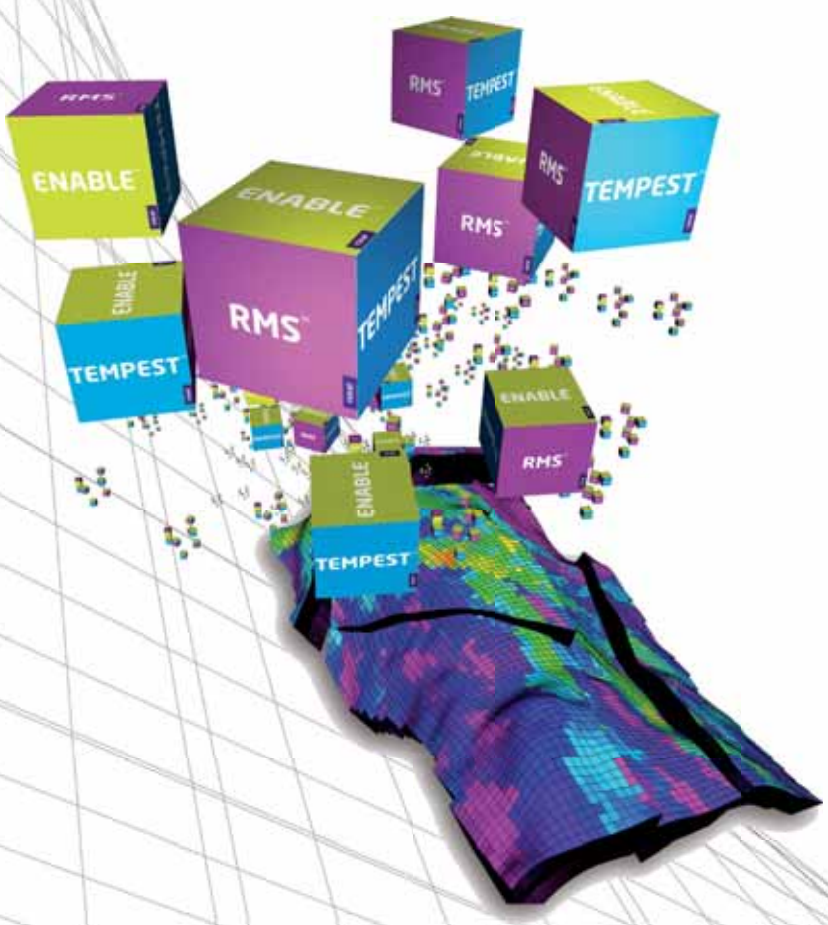

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