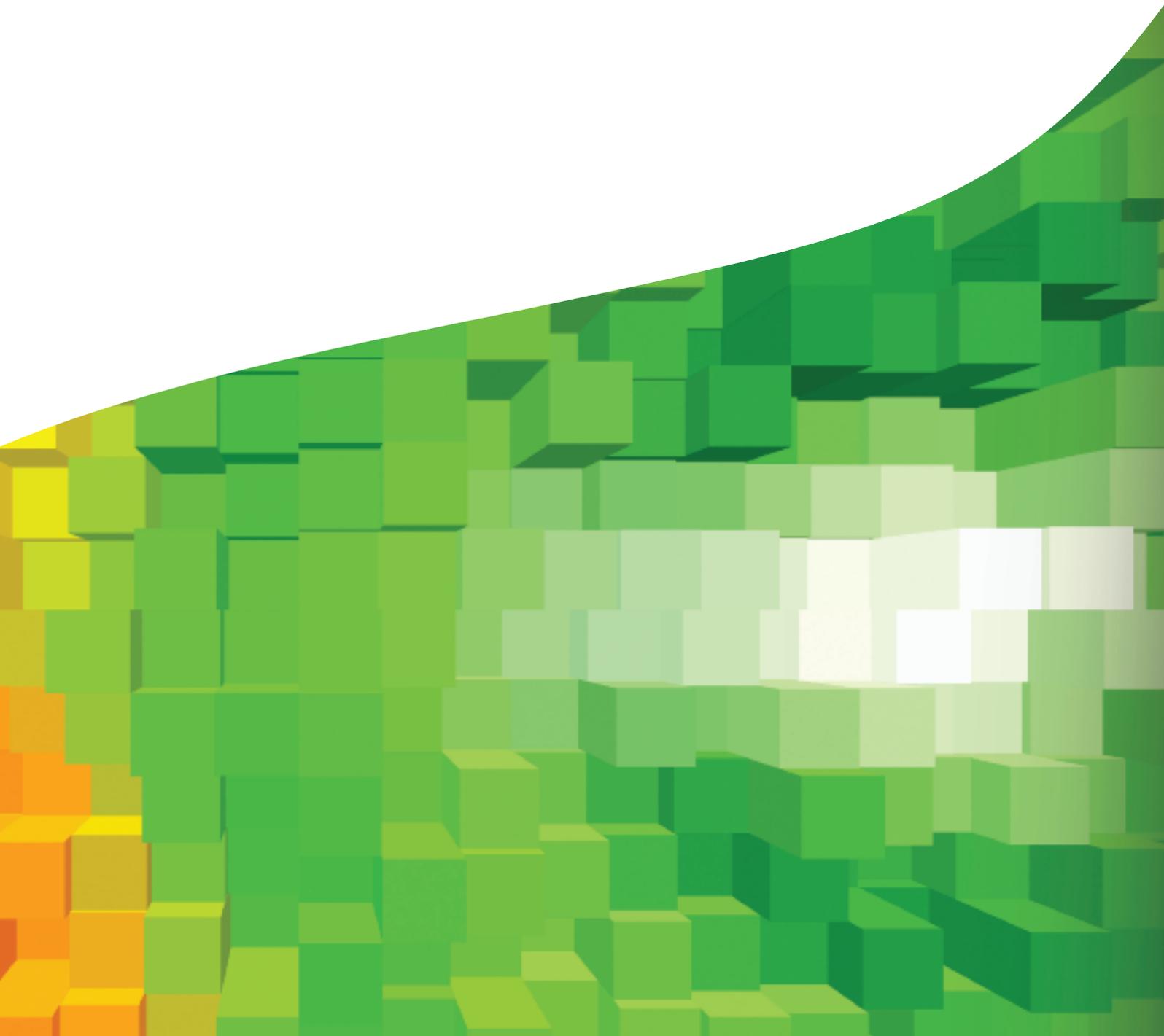


TechnoVision 2012 For Upstream Oil and Gas

Point of View by Pat Quinlan, Dave Knox and Mark Dickson



Future Vision 2012

In our look at the possible future we introduce you to a company and bring you its experience of two futuristic situations. The first sample vision focuses on Real-Time intervention where a work team identifies an issue with a production operation and promptly assesses the situation from an operations support center. The virtual team makes a decision and then implements it, all within a span of about ten minutes.

The second vision depicts Remote Collaboration. The situation is similar to the first vision but in this example team members engage via a PDA and through a web-enabled collaboration network established with an equipment manufacturer. Again the investigation, analysis and action takes place in only minutes due to the immediate garnering of expertise from the virtual team.

At a time that is not that far, far away...?

An Excerpt from the Exceptional Business Review, June 2012

Smart Oil Company, a North American based Upstream (Exploration & Production or E&P) company, continues with its efforts to find better ways to manage costs and increase production. It is doing this by finding new ways to leverage the skills and expertise of its people. At one time, this expertise was largely confined within an asset team or a project team with limited opportunities to share experience with others short of moving to a different team.

The technical and operations workforce relied heavily on local knowledge and expertise. They had limited chances to collaborate with other teams beyond periodic internal conferences and individual network relationships. There was no specific technology to support cross-team collaboration or to easily capture and share their collective daily engineering and operating decisions.

This has now changed. Smart Oil Company, based in New Orleans, Louisiana, took a bold step and created a new, collaborative work environment: a full time support center for all onshore and offshore operations. This has not only changed the way Smart Oil Company engineering and operating staff work together but will continue to pay off for years to come.

The collaboration center monitors and supports all their drilling, operating and supply chain activities. These cover rigs, wells, field processing and gas plants together with the interfaces with engineering consultants, suppliers and joint venture partners, throughout the Gulf of Mexico, continental U.S. and Canada. The center employs the latest in oilfield surveillance techniques to gather and evaluate the 200,000 data points, or tags that flow into the collaboration center each minute. This information is used by drilling and operations engineers, and maintenance staff to make real time decisions leading to improvements in daily production and the lowering of costs. Advanced software tools continually sift the data and, when necessary, initiate a process that includes reviewing data trends from similar situations. The tools

automatically access Smart Oil Company's knowledge network and continually documents reviews and decisions that are fed back into the knowledge network.

With more complex formations and more operations to manage in increasingly marginal basins, Smart Oil Company has found that their investment in collaboration technology is paying off. Smart Oil Company now provides improved support to their engineering and maintenance staff. It cost-effectively manages roles, provides more intense training, and generally better utilizes the skill and experience of its people. The Smart Oil Company VP of Operations credits the vision of the project team and their ability to fully prove the concepts in the early demonstrations for transforming the Smart Oil Company that is changing the way it works. He says, "We took a deep breath a few years ago, reviewed the key factors for our future success, and used a novel approach to provide a roadmap for our competitive success. Though we made a few mistakes, we learned quickly along the way. Our current success is not by random chance!"

Smart Oil Company: Vision of a Real-Time Intervention in 2012

They sit, bathed in the glow from the bright plasma screens high above the Central Business District (CBD). Laura trains her fellow technician, Beaux, to use the on-line workflow manager. John, the surveillance engineer, hurriedly enters the room with a large folder in hand entitled "Bad Actors", and walks toward her, full of improvement ideas. Production data from wells, subsurface profile information, the latest 4D seismic – all

displayed crisply above. Three years after the initial field development, the team performs its daily vigil of maximizing equipment, well, and reservoir performance.

Suddenly, Laura's attention is diverted by a gentle alarm that heralds an overhead screen change. Production curves show that rates have dropped below modeled levels and water cuts are rising on one of their fields. She glances towards John, the surveillance engineer, who grabs a monitor and quickly shifts screens to show original mud logs, open-hole and cased-hole logs, and a fence-post diagram. Beaux takes command of one of the smart plasma screens that displays completion intervals, the latest well tests, PVT data and measurement quality. An automated alert on one of the plasmas provides them with a list of similar situations from prior years, a brief summary of the actions that were taken, and the final outcomes – their real-time knowledge management system.

A few point-and-clicks away, John determines that the cumulative production and original reserve estimates are close to expected depletion plans. A shared understanding unites them all; the zone is watering out and needs to be shut-in. Laura clicks on an icon to initiate a videoconference with the platform personnel. Emile responds on the crisp video feed, "I was just about to call you regarding that recent alarm." A brief explanation of the analysis ensues, while those on the platform follow on their mirror-imaged systems. The consensus comes swiftly - this zone has run its race. The system documents their decision to further

enhance the knowledge base. Emile commits to closing the subsurface valves as prescribed by the workflow diagram displayed on his screen, including the safety protocols. The platform operator makes a few mouse clicks, and the sliding sleeve closes to shut in the wet zone. Their vigil resumes.

Smart Oil Company: Vision of Remote Collaboration in 2012

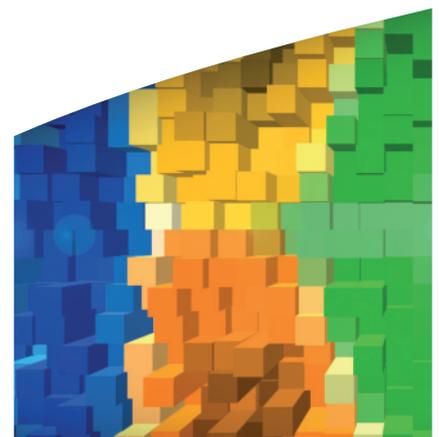
Cheryl reaches her office. She logs in to determine the progress of a few action items and alarms that she chose to address on her PDA while on the vanpool. One of those alarms was particularly disturbing – that same bad actor – a Recip compressor.

The phone rings, and it is the Recip technical support center, coordinating a conference call with her, the collaboration center technician, and platform operator. They are also concerned about the recent alarm from the compressor. Their detailed analysis shows high vibration, heading towards failure though currently functioning acceptably. Cheryl follows along with the analysis on the secure Recip website. The collaboration technician describes the last three alarms on the compressor, the results of the most recent tear-down, the 60-day vibration trend, and the recommendations from the expert system. Cheryl sighs heavily. While happy to have collaboration, real-time desktop sharing, she is pleased that it is no longer her that has to get everyone together!

The collaboration center technician then leads a short brainstorming session as part of their structured root cause analysis exercise for equipment failure. They reach a stopping point, a

moment of self-doubt. The technician mentions the online Rotating Equipment Community of Practice home page, listing global experts. One more click and the technician has contacted a Rotating Equipment Specialist in Nigeria. He joins the call, views their data, and recognizes the potential problem. The Recip support center considers it thoughtfully.

The platform operator hadn't known about the specific lubrication specifications. All the while, the technician documents this activity with screenshots and simple comments. Cheryl likes what she hears, and encourages the technician and platform operator to complete a new work order and modify the preventive maintenance plan to include detailed oil and grease specifications. They now feel encouraged; one more "bad actor" down! The system will automatically track their fix's progress.



Introduction

Capgemini develops long-term solutions for oil and gas businesses in their use of technology to enhance performance. To this end, TechnoVision is Capgemini's strategic framework to help clients create competitively-advantageous innovation for their organizations. TechnoVision 2012, as applied to E&P businesses, creates a technology-focused vision of the future. It is based on trends in both large, multinational companies and smaller independent oil companies. It is significantly influenced by new developments in the ways people work throughout other industries, and incorporates many of those practices that can be wisely leveraged. This technology vision varies slightly amongst upstream, midstream and downstream, but there are many re-usable concepts as the business drivers are similar.

The market pressures on oil and gas businesses seem to change as rapidly as the price of the commodity. More recently there was a shortage of personnel, resources, and a surplus of opportunities. Now as commodity prices have fallen to one third of what they were we find a shortage of opportunities and a surplus of personnel and resources. Although the circumstances and environmental factors continuously change the challenges remain substantially the same.

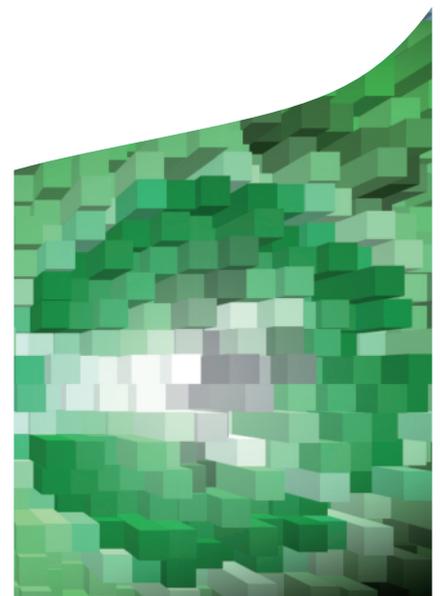
To find the oil and gas accumulations as surgically as practical, minimizing uncertainty and accurately predicting the type, size and location of the accumulation is necessary. With single development capital requirements reaching the billions of dollars, optimizing the solution for developing the discovered accumulation is even more critical than ever. Poorly placed wells, or too many or too few wells can have a dramatic effect on the ultimate return on any given project almost without regard to the size of the accumulation. Producing assets, whether from aging systems and infrastructure, or more modern, higher rate installations; both require precise attention to the right level of detail to optimize performance and resolve production issues and problems.

Environmental focus has grown in every area of oil and gas operations. This is beneficial for both business performance and for public relations. With changes in political landscape in many operating areas, regulations will continue to evolve and the industry will respond with newer technology enabling improved performance, reduced emissions and smaller footprints on the landscape. All of the technologies addressed in this point of view paper will work toward these business requirements.

Advances in technology have enabled exploration, drilling, development and operation in areas of the world previously thought to be inaccessible. The ability to further optimize these innovations and to develop new ones

for yet unexploited areas of the globe will depend on the technologies and capabilities addressed herein. The rapid acceleration of the plan-do-act-evaluate cycle of these technologies with further increase the dependence on these digital technologies

So, with the backdrop of constant change and continual focus on value drivers we keep our eyes on the socio-economic factors and technology leverages to help deliver the product as optimally as possible. The following will introduce and clarify how and where TechnoVision fits into your business whether as a large multinational oil company or as an independent.



Introduction to TechnoVision 2012

TechnoVision 2012 For Upstream Oil and Gas will summarize select key business drivers that are now affecting the industry. These business drivers should resonate with all E&P companies to varying degrees. There will be others based on individual situations, but these are common to most. “Technology Clusters” are overlain against these business drivers to ascertain their relative merit in addressing the business needs; this mapping creates a framework for a joint business and technology vision to guide the enterprise to material competitive advantage.

Significant work remains for numerous oil and gas companies in foundational areas like data management, automation, and business process standardization. There are ample examples that exist where companies have successfully implemented advanced capabilities such as real-time decision making, worldwide exchange of information (“one version of truth”), automatic maintenance scheduling, or digital, personnel geo-spatial awareness.

Technology is advancing rapidly in almost every aspect of our lives. From our own households and mobile phones to Wi-Fi (Wireless Fidelity) spaces in coffee stores and other retail establishments, new digital functionality is growing. This is also true of the E&P business. More data is available on our desktops and mobile devices, providing exceptional insights into field, well, and facility performance. Even today, operations collaboration centers connect people

and information, share real-time data, and bring global expertise to bear when and as needed. Days and weeks are turning into hours, minutes or even seconds. There is also a cautionary tale amongst this growing digital capability: how to best manage the huge amount of information for better decision making.

TechnoVision is more than new kit, more than faster communications infrastructure, more than the latest analytical application. At its core, TechnoVision 2012 is about changing the way we work, as individuals, as teams and as a business. It can help E&P businesses attain game-changing capability by creating a framework for a long-term view that is coupled with well-integrated, well-coordinated tactical solutions. This will allow for a company to phase their journey and accommodate organizational, operational and budgetary realities while progressing toward their own, tailored end-state. Value can certainly be realized along the TechnoVision 2012 journey.

This framework is not intended to be a one-size-fits-all, but a collection or grouping of technologies (“clusters”) which can be readily aligned with your business drivers and enable effective technology deployment. The term “Technology Clusters” will associate the key, enabling technologies with long-standing business processes (greater detail can be found in a following section of this paper).

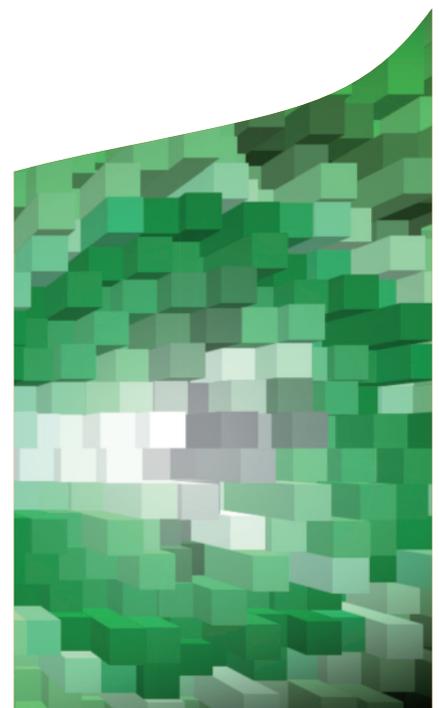
In summary, these technology clusters will focus on six key areas:

- 1. The You Experience:** How the organization empowers employees to improve job performance by focusing on a tailored employee experience that falls within the acceptable ranges of organizational variability. Consider, for example, how retail consumers have created their own user interfaces through configurable web applications.
- 2. From Transaction to Interaction:** How employees interact with each other, and with those across internal and external barriers. Data-rich companies in other industries are using intelligent assistance to focus on the truly rich-information, providing a means to increase insight on the relevant issues that demand human interaction.
- 3. Process-on-the-Fly:** How business processes can be created, improved, and communicated. Any business process, standardized around a best practice, can be quickly improved through the use of tools that integrate the right applications, datasets, and other relevant inputs. This is a crucial capability when integrating with or interfacing with partners, regulators, National Oil Companies (NOCs) or service providers.
- 4. Thriving on Data:** How data and information can be better used - today. Sifting through the data storm, avoiding data numbness, and extracting the few nuggets for meaningful action are the goals of this cluster.
- 5. Sector-as-a-Service:** How to liberate the precious organizational energies by differentiating the core, valuable work from the work that will never differentiate the business, no matter how necessary it may be. Simplifying, standardizing, re-engineering the non-core work is essential to allow the right focus on the competitively differentiating value.
- 6. Invisible Infostructure:** How data and information can be acquired and managed, quietly and automatically with minimal human intervention. For those in the organization that can help to differentiate it, any time spent on finding or assuring data or information translates into lower productivity – a practice that must end throughout E&P.

Open Standards and Service

Orientation: Open standards, affording a plug-and-play environment, form the foundation for these six technology clusters, amounting to a key, enabling platform.

Key Business Drivers for E&P will be defined in the following section. Once articulated, they are matched with the technology clusters in the TechnoVision framework. It is the answers within each intersection of this framework – matching the technology cluster solutions to a business driver - that define the organization's potential roadmap to competitive advantage through technology.



Exploration & Production Markets define the Key Business Drivers

Business drivers are a term that is used to describe the *now-relevant*, significant factors for the entire E&P industry. There are other meaningful factors (“fundamentals”), not listed here that are part of the fabric of the industry – whether it was in the turbulent 1980s, the present, or the uncertain future. A few examples of these are Reserve Replacement, Production Optimization, Operations Excellence, or Cost Management. This paper addresses key business drivers over and above those fundamentals. In short, the business drivers are weighted towards succeeding *today and in the future*.

The Upstream industry is now recovering from an unprecedented period of volatile price and activity. Fuelled by strong demand in China and India, oil prices rose to historical heights, only to recede dramatically in recent months by 75% or more. Drilling rig utilization peaked in the high 90 percentiles and rates for all services reached new levels. Although growth of the major world economies has recently and abruptly slowed or contracted, world energy demand, according to most sources, will continue to increase in the long-term.

The best estimates of world reserves places more than 60% of oil reserves and more than 70%¹ of the gas reserves are in countries where the hydrocarbons are managed by a NOCs, or equivalent. Combined with strong, demand-driven prices, renewed nationalism (or a growing national confidence) this has created a metamorphosis of these former, slow moving giants. With an aggressive commercial awareness, these well-financed NOCs² are now setting much of the direction of new capital investments, technology advancements, and business management.

1. The Growing Influence of NOCs

There are a number of geo-political and nationalistic trends driving the emergence of the NOCs. Simply put NOCs now control most of the world's remaining oil and gas reserves with recent reports indicating that the traditional global integrated oil have access to less than 10% of the remainder.

Whereas previously global majors leveraged their technical and operational expertise and joint ventures to access global resources currently the end-game for most NOCs is to develop their own E&P capabilities which leaves them with a long-term vulnerability. As long as the NOCs can finance their development and operations, this issue is unlikely to change. One challenge for the

traditional global majors is how to better use technology to optimize what they have and help them earn access to resources currently unavailable to them.

2. Exploiting Unconventionals

This limited reserve access for non-NOCs has forced large E&P companies to exploit increasingly more difficult resources. These unconventional sources, particularly tight gas (such as coal-based methane and shale gas), heavy oil (including tar sands and bitumen), stranded gas (for conversion to LNG), ultra-deepwater, and shale oil (mined and in-situ), will play a larger role in the future E&P company's portfolio.

3. The Aging Workforce

Increased activity driven by the past record run up in pricing has highlighted one of the industry's weaknesses – the diminishing capability to properly implement and manage the large number of new projects. Evidence of delays and rework has been well-publicized via some spectacular failures. One exposed weakness leading to this is that more large E&P company experience is leaving the industry than is joining it (especially in North America and Western / Northern Europe). Retirements continue, even now, at a faster rate than hiring and the average employee age hovers near 50.

¹ Capgemini Analysis of reserve data from the EIA International Energy Outlook September 2008

² E.g. Saudi Arabia, Iran, Iraq, Kuwait, China

4. Alignment of Quality Provisions

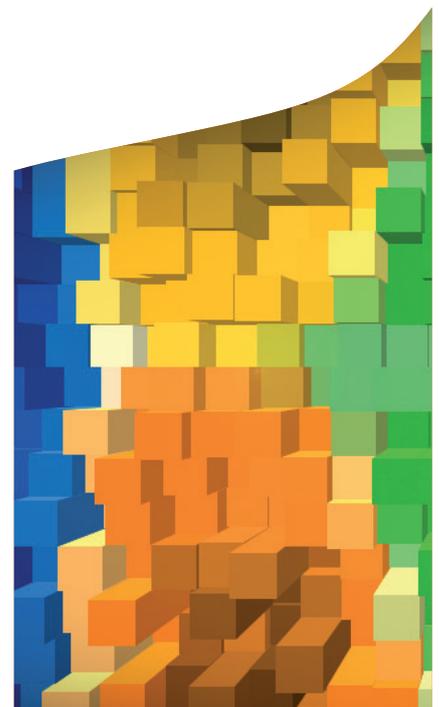
The project delays and rework are also based on the limited contracted service, equipment, and material availability. One industry analyst³ outlines that the cost of Equipment, Materials, Personnel and Engineering have all increased between 15 to 20% in the period from 2001 to 2007. This was followed by an unprecedented retreat in oil price and hence the demand for services. This roller coaster trend will continue indefinitely. So, balancing the long lead-times (years) for drilling rigs and highly-engineered components with variable business demand and opportunity is the challenge.

Large E&P companies are largely dependant on the vast supplier ecosystem and typically spend US\$10 to 12 outside the organization for every dollar it spends internally. This ecosystem has been subject to the same forces of volatile supply and demand as the E&P companies have been. In many cases, the suppliers feel the effects of volatility before the E&P companies. This has, over time, created a conservative financial and hiring approach in many, large oilfield service companies. And the same demographic factors for hiring and retirement apply here too (it is a

similar hiring “gene pool”), though muted as the service companies tend to hire a much more international workforce.

5. Increased Public Scrutiny for Compliance Excellence

E&P activity has become more global, complex, and risky over the past 20 years. During that time, there have been safety- or environmentally-related events that have demanded significant self-inspection throughout the industry. A few of these events have dominated news headlines and created a sustained, heightened awareness of Health, Safety, and Environmental (HSE) issues. The current wave of eco-environmentalism has also contributed to this heightened sensitivity. Local communities and governmental bodies are, more than ever, demanding a safer workplace for the employees and a smaller impact footprint during and after the extraction.



³ Harrison Lovegrove and Herold: Industry Spending Trends, September 2008, citing Chinese National Offshore Oil Company (CNOOC)

Sample Business Applications of Technology Clusters

The technology clusters are designed to have the right granularity to be used in the communication between technology and business executives, mapping the business drivers of an organization in a simple way to the technology solutions that address them. In Capgemini's TechnoVision, Business Drivers are significant efforts aimed at exploiting an opportunity or an innovation, correcting an issue, or coping with a disruption or a compliance need (see the chapter "Applying The TechnoVision Framework").

The clusters can easily be expanded from the basic groups to the actual products which link to the solutions. The following clusters and examples of capability within oil and gas businesses will help to explain and clarify key opportunities suggested in this paper. The linkage between the clusters and business capability created is usually self evident but in some cases may be more subtle. Please note, however, some overlap between clusters is inevitable when talking about the business capability.

For example, the first cluster, *The You Experience*, contains an example of desktop computer displays, configured by and for the individual, an engineer perhaps, containing specific information that pertains to his or her job and role. The user in the example "creates" their own environment in order to optimize the way "they" work. Due to the close relationship of digital systems and functionality there is necessarily some overlap between the clusters addressed herein. Obviously in the example of the engineer who configured their computer display there would be serious limitations on functionality without the data contained in significant portions of the

information displayed. This suggests and inevitable overlap with cluster number four, *Thriving on Data*. On reading this point of view it is possible to identify additional opportunity and capability within the cluster or even between two or more clusters.

In addition to six operational clusters, TechnoVision incorporates one technology cluster called *Open Standards and Service Orientation*. It is not operational in itself but underpins all the others. Whenever we are confronted with the 'what's new' question about the technology clusters, we find that the emergence of true open standards and the principles of Service-Oriented Architecture (SOA) are making an important difference.

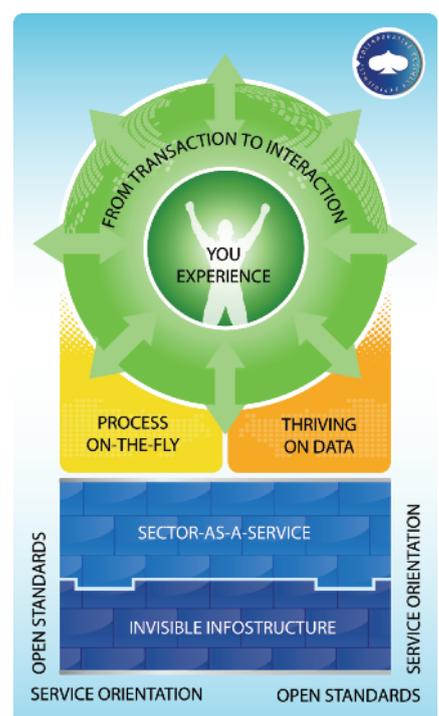
Each cluster can also be defined by between two to four more detailed categories of technologies, culminating in 17 key Technology Building Blocks. Capgemini's TechnoVision depicts the seven clusters in an architectural diagram.

1. The You Experience

A new generation of user interface technologies provides a compelling, highly individualized experience. Through these technologies, users connect freely to the outside world to act, interact, collaborate, co-create, learn and share knowledge. It's 'You, the people' who are driving this global change.

The You Experience shifts the focus of solution development away from solutions that are designed and built beforehand. Instead, unique, tailored systems are quickly orchestrated from fine-grained components ('services') from sources both inside and outside the organization.

An E&P example could be the use of role-based portals that display only the relevant information to the petro-technical professional. This can be expanded to desktop computer displays, configured by and for the individual, containing specific information that pertains to his or her job and role. The user in the example "creates" their own environment in order to optimize the way "they" work. This may include certain networking capabilities with a variety of expertise either within or outside of the company. It would also likely include streaming data of well or facility performance or in the case of a product marketer or financial analyst perhaps locale specific financial indicators. Links to my current project team and my organizational peers would be active links continually.



Another example of The You Experience would be accessing training and development opportunities. These may be face to face coaching sessions with a mentor or perhaps a link to a university class in real time or simply a computer based training application that one can start and stop as time permits.

Much like today's Internet enabled widgets that provide certain functionality to employees' computer screens, they will be able to select displays of certain performance data which may be organized by asset, well type, equipment type and may be focused within a field or broadly distributed locally. Then searching and filtering functionality will enable the investigation and analysis of the information for identification and resolution of pending performance issues.

2. The Shift from Transaction to Interaction

This cluster includes capabilities that help organizations externalize their information, processes and events. By truly connecting to the outside world, fixed, predefined business transactions become ongoing relationships with clients and partners. These are all engaged in a continual cycle of learning, collaboration, innovation and co-creation of concepts, ideas, knowledge and tangible products.

This is a 'mesh network of everything' in which systems and information are shared by default, and new opportunities for collaboration—sometimes ad hoc or short-lived—arise over and over again. Organizations, and their subsets, continually create opportunistic business mash-ups in which they

draw together combinations of their own services and those of other organizations to quickly respond to opportunities, events and challenges.

Currently, a storm of production alarms drives production teams to a data numbness, whereby the future will afford production to focus on the vital few events. The managing of them by exception and creating more intimacy with the data truly demands attention.

An easy way to think of this particular capability is to compare linear communication (transaction) to a more circular communication. With circular communication, a team of individuals associated with a particular system or operation can be mustered at a moments notice.

As in the sample futuristic visions at the beginning of this paper, the collection of affiliated personnel then access data and models to ascertain detailed evidence of a looming problem and then can collaboratively assess the situation and create a preemptive resolution. Some circumstances may require a reactive response but that will be less and less the case over time. Smart systems will learn to recognize patterns of performance and alert the responsible parties well in advance of the problem.

Transaction to Interaction clearly has application to procurement of the vast amounts of materials purchased each day by industry professionals. Increasingly these activities are simplified by connecting service and product providers directly to the data or information at the production site which enables them to track

independently, the demand and timing for engagement of their product or service.

For example for onshore wells with fluid production, the hauling company is linked via tank instruments to identify when a tank is sufficiently full for offloading and then plans their route with GPS enabled devices to optimize their route through the maze of remote dirt roads. This enables procurement specialists, operations personnel and service company management to focus on strategic aspects of the business relationship as opposed to the transactional events of securing a truck to offload full fluid tanks.

One key aspect of *Transaction to Interaction* will be the establishment of social networking platforms within the businesses. Due to the highly technical nature of much of the oil and gas business, it will necessarily include details of past assignments and responsibilities of each individual. It will also include any technical publications or analyses to enable the linking of expertise to current needs. The networking solution will necessarily be searchable on a variety of levels and in a high level of granularity. So, when individuals are confronted with new challenges, "My Assistance" can be obtained in only minutes, and perhaps a solution if already determined in a previous situation obtained immediately.

3. Processes-on-the-Fly

These will be assembled by orchestrating the building blocks of underlying services. Organizations will need to change their processes in near real-time to quickly reflect and accommodate changes in the business

ecosystem. The underlying information systems that support and enable these processes must consist of fine-grained, configurable services that can be freely composed and orchestrated into new solutions. Teams will be able to refine key Production Surveillance processes as new technologies or other innovation occurs. Processes that require external suppliers can be changed quickly to accommodate new providers as performance of former ones deteriorates.

Processes will that be assembled *on-the-fly* will not be applicable to all processes. Regulatory and safety critical processes, for example, would for the most part require rigorous management of change protocols to implement a change. Some safety processes, however, like crisis management could be enabled with this cluster. Depending on the

severity, type and location of the major event, reporting relationships, decision making and engagement responsibilities could be shifted based on specific expertise and availability. Further, resources from other assets could be easily leveraged in the response.

4. Thriving on Data

Detailed insight into large volumes of crucial data is a necessity for organizations that want to navigate a constantly changing, information-rich environment. Enterprises that know how to connect the use of data to its strategic objectives are literally *Thriving on Data*. These organizations are continually reading, analyzing and reacting to information inside and far outside the company boundaries.

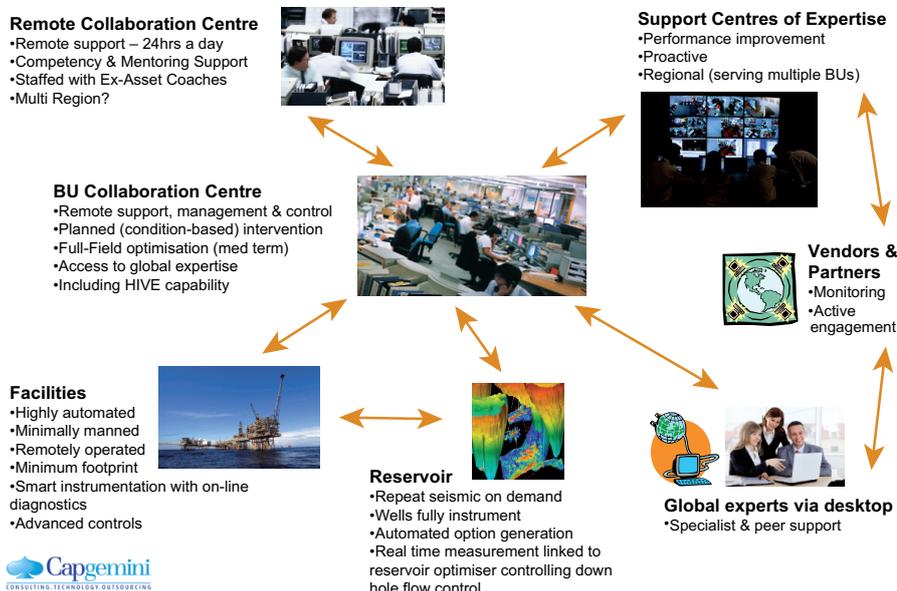
Intelligence will be an integrated, fully embedded part of every worker in a company, supporting real-time

decisions on the spot wherever and whenever they are needed. Data mining will become the norm for equipment and well production data trends, whereby key relationships will be identified and documented that will provide the data-based focus on the vital few variables to afford management-by-exception.

Oil and Gas businesses rely on data in every aspect of the business. Increasingly a key to improving the business is by enabling all employees to access all data. The organizational silos are disappearing and access to real time production data by anyone from anywhere is growing. These data can be used by marketers, financial analysts, and production optimization personnel alike. Data is filtered and sorted to the level of detail required by the individual. It feeds graphical displays (configured by the user in *The You Experience*) which apply certain formula to provide the user with the actionable information they require. The data may simultaneously feed business models for reassessing future projections and ensuring continuous alignment with business targets and objectives.

The removal of traditional barriers like firewalls will enable the user to engage the system from hotels, airports, home or the office in the same way. They will be able to participate in evaluation and analytical sessions with teammates and coworkers when needed. Many solutions which now take months to develop can be realized within weeks or even days because knowledgeable staff has access common data and can be engaged very quickly to support a particular business need.

Examples of “Transaction to Interaction”



5. Service-as-a-Sector

Core, commoditized business solutions will be increasingly delivered as little-customized, standard software or service, even supplied through Software-as-a-Service. More and more market- or sector-specific core services will be delivered through this mechanism, freeing organizations from having to spend the bulk of their time, budget and resources on building and maintaining commodity systems. Eventually, many of these 'sector services' will be completely executed by external providers.

Standardized sector / segment solutions are replacing legacy systems, or legacy systems are 'stabilized,' providing them with service-oriented interfaces without intruding on their inner functions and structure. Unmistakable is the movement from classic ERP to orchestrated business services—sector / segment specific, cross-sector, function specific, cross-function, cross-company services. E&P has taken great strides in leveraging large outsource providers for back-office activities such as finance, accounting, and benefits management. These have proven worthy models from which to continue this success. Similarly the well drilling function and select maintenance processes have been largely handed off to service providers in a number of areas.

Increasingly, particularly within NOC relationships, the large service companies are providing well and facility maintenance, system optimization and even well surveillance and intervention. Though not commonly thought of as an outsourced aspect of the oil and gas business it is moving in that direction. The enabling digital systems applied in *Thriving on Data* and *Transaction to Interaction* will largely be the key to this evolution as well. Service companies will be directly connected to the relevant performance data and automatically deliver the requisite service or intervention. This allows a more strategic focus on the part of oil and gas professionals and management.

6. Invisible Infostructure.

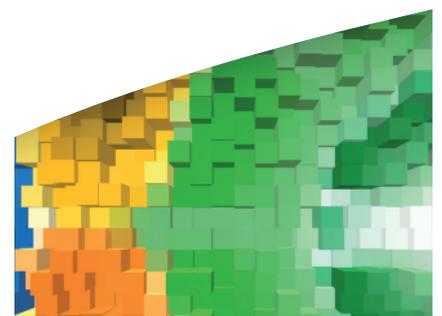
Infrastructure evolves into a utility-style invisible infostructure, supplying all the infrastructural services that an organization needs to responsibly and securely run its business on, including application, information, exchange and collaboration services and—sooner or later—core commodity business services. Organizations will liberate themselves from the complex tasks of having to run basic infrastructural services such as computing power, storage, networking, desktop clients, security and identity. These infostructural services increasingly will be supplied from an Internet 'cloud,' which hides the details of suppliers, technologies and systems.

The previous mention of removing traditional barriers like firewalls in *Thriving on Data* suggests that with *Invisible Infostructure* security will evolve toward encryption routines and

access to information will be enabled by role based portals. This will enable delivery of data and information via the Internet to the correct individuals regardless of location.

Open Standards and Service Orientation

These are a crucial element in Capgemini's TechnoVision, because organizations can only collaborate effectively and achieve a boundary-less information flow if they speak the same, widely accepted and recognized language. Proprietary standards are often solid and established but they fail when more parties are involved; therefore the only way forward for organizations is to adopt global, open standards. The industry has made some progress with common XML schemas and common industry domain models based on standards which enable web based services and ensure common data relationships. WITSML and PRODML are such schemas which have been used to enable movement of drilling and production data from and to various users for some time. This will continue to deepen and expand as the demand for the capabilities addressed in this paper increase.



Applying the TechnoVision framework – TechnoVision 2012 in Upstream

Aligning the Business Drivers with the technology clusters results in a matrix that requires a complete analysis of the role of the technology clusters in relation to the Business Drivers. Answering the key questions will begin to shape the company-specific TechnoVision:

1. Is the technology cluster a **CAUSE** of the Business Driver, a major **HELP** in addressing the Business Driver, or a **MUST**-have in response to the Business Driver?

2. To what degree is that technology cluster and the organization ready for deployment to respond or address the Business Drivers (green = now ready; yellow = ready soon; red = work required to be ready)?

Based on the Business Drivers listed above, an example of the TechnoVision framework appears as such, where the intersection of business drivers and technology clusters will form the basis for one or more projects into a program.

		Technology clusters						
		You ex- perience	Transaction to interaction	Process-on- the-fly	Thriving on data	Sector-as-a- service	Invisible info- structure	
Business Drivers	Influence of NOCs		M	H		H		
	Exploiting Unconventionals		H	H	M		H	
	Aging Workforce	M	H			M	M	
	Quality Provisioning			H	M			
	Public Scrutiny	C	M					
	Fundamentals	M		M	H			

The above diagram is only a sample to demonstrate the process for aligning technologies and business drivers. This should be developed with your particular enterprise in mind.

Where to Begin

The technology choices are daunting. Pursue the wrong ones, or the right ones at the wrong time, and CIOs and business executives will find themselves and their staffs wasting precious effort and missing valuable opportunities. Engage the right critical mass of internal and external stakeholders to:

1. For your context, refine the business drivers for your company, region, or asset. They will likely vary based on regional differences, company size, or other factors. If “Fundamentals” continue to be your focus, they may be dissected into, cost control, reserve additions etc.
2. Ground the technology clusters in terms that are relevant for your business situation. These technologies may drive your efforts in different directions. Test the linkage from Business Driver to the technology cluster. Understand how the technology will replace
3. Work hard to integrate the overall effort into a single, well-coordinated strategic Program. This Program will consist of a few to several technology initiatives or projects. These may be phased, or piloted, to ensure minimal interruption and allow for organizational uptake. Define the linkages between the projects themselves as well as with other initiatives within the organization. This step is important as it represents key leverage points and often incremental value.
4. Use robust project and program management practices to ensure that the projects are properly defined, sequenced, and executed. With a program of this nature, there will be foundational initiatives which are required before more advanced capability
5. Once the projects are defined, sequenced, and resourced, it is necessary to finalize the execution plans. This should include basics such as the project plan, roles, accountabilities, and a governance model.

can be deployed. This impact analysis will establish clear lines-of-sight from the specific project to the related projects, and, ultimately, to the business performance metrics.

Your nearest Capgemini professional can assist you with developing and delivering your TechnoVision journey. We hope this has provided at least some stimulating and thought provoking concepts for your oil and gas business. Perhaps it has given you new insights into the process of matching business needs with technology functionality. As with life in general the only constant is CHANGE.

The table below summarizes the development approach for Capgemini’s TechnoVision Framework.

	You do persistence	Transition to interaction	Process-on-the-fly	Thinking on data	Service-as-a-service	Mobile job structure
Influence of MOCs		M	H		H	
Enabling Unconventionals		H	H	M		H
Aging Workforce	M	H			M	M
Quality Provisioning			H	M		
Public Scrutiny	C	M				
Fundamentals	M		M	H		

	I. Define Business Drivers	II. Align Drivers & Technologies	III. Define projects within intersections	IV. Develop prioritization	V. Develop execution plans
Overview	<ul style="list-style-type: none"> Identify regional drivers in light of corporate boundaries Identify current initiatives supporting drivers 	<ul style="list-style-type: none"> Define details of technology in light of desired functionality Develop clear understanding of technologies and impacts 	<ul style="list-style-type: none"> Develop projects Define linkages between projects and existing initiatives 	<ul style="list-style-type: none"> Develop alignment and sequence of projects 	<ul style="list-style-type: none"> Secure resources Project approvals Project close-out
Activities	<ul style="list-style-type: none"> Assess priorities of drivers Determine organizational linkages Identify key players for input 	<ul style="list-style-type: none"> Map technologies to business drivers Identify resources and develop Framework for projects 	<ul style="list-style-type: none"> Define future-state business process(es) Document future-state business process design 	<ul style="list-style-type: none"> Impact analysis Cost estimates Schedules 	<ul style="list-style-type: none"> Define roles and accountabilities Identify reporting metrics
Deliverables	<ul style="list-style-type: none"> Charter with drivers, owners and detail 	<ul style="list-style-type: none"> Preliminary business case Preliminary budget 	<ul style="list-style-type: none"> Future-state business process design(s) Approved Charter(s) 	<ul style="list-style-type: none"> Project Plans Detailed Business case 	<ul style="list-style-type: none"> Project execution plan Governance Model
Ideal Duration	2-4 days	20 days+	10 days+	Variable	Variable



About Capgemini and the Collaborative Business Experience

Capgemini, one of the world's foremost providers of consulting, technology and outsourcing services, enables its clients to transform and perform through technologies.

Capgemini provides its clients with insights and capabilities that boost their freedom to achieve superior results through a unique way of working, the Collaborative Business Experience. The Group relies on its global delivery model called Rightshore®, which aims to get the right balance of the best talent from multiple locations, working as one team to create and deliver the optimum solution for clients. Present in more than

30 countries, Capgemini reported 2008 global revenues of EUR 8.7 billion and employs over 92,000 people worldwide.

With 1.2 billion euros revenue in 2008 and 12,000 + dedicated consultants engaged in Energy, Utilities and Chemicals projects across Europe, North America and Asia Pacific, Capgemini's Energy, Utilities & Chemicals Global Sector serves the business consulting and information technology needs of many of the world's largest players of this industry.

More information about our services, offices and research is available at www.capgemini.com/energy

Contacts:

- **Pat Quinlan** pat.quinlan@capgemini.com
- **Ian Moore** ian.moore@capgemini.com
- **David Knox** david.r.knox@capgemini.com