

# The Promise of the Virtual Oil Company

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## The Oil and Gas Industry Is at an Inflection Point

World demand for oil and gas is at an all-time high as emerging economies demand increasing amounts to fuel their growth. The Energy Information Administration predicts that world oil demand will grow from 80 million barrels per day (at 2003 levels) to 118 million barrels per day by 2030. The majority of oil and gas reserves that will be needed to satisfy this increasing demand are located in either geographically remote or politically sensitive areas (or both), making them more difficult and expensive to exploit.

Within the context of increasing demand, international oil companies (IOCs) must continually replenish reserves depleted by production. Similarly, national oil companies (NOCs) look to manage their reserves to maximize the wealth that, in many instances, supports social and political needs in their countries. Service and supply companies need continued access to knowledge workers and experienced industry personnel that underpin their businesses. It is clear that these factors will lead to increasing competition for access to both reserves and skills. Consequently, to meet the demand challenge, the industry must embrace new ways of working, along with new technologies. Indeed, to succeed and ensure long-term business continuity, oil and gas organizations need to become borderless, or virtual.

**Access to Skills:** Demand requirements make it essential to maximize production from both existing and new oil and gas fields. Given that the oil and gas industry is one of the most knowledge-intensive industries,<sup>1</sup> and that the interpretive capabilities of industry professionals will be needed to deliver against this requirement, the oil and gas industry's demand for these specialized skills is already outstripping supply. Compounding the problem, in traditional oil and gas locations such as Houston, Aberdeen, and Calgary, where a significant proportion of the industry skills are located, individuals with the needed expertise are aging. As these people leave the workforce, there are not enough skilled workers to replace them. Fewer young people are choosing to pursue careers in engineering or science (and, specifically, in oil and gas), leaving a serious gap between the industry's need for skilled people and the available worldwide supply. Additionally, there is a mismatch in the location of industry skills as, spurred by economic aspirations, "emerging" countries such as China, India, and Venezuela produce a surplus of oil and gas professionals. These skill requirements present a major challenge to the oil and gas industry (and, specifically, to IOCs and service and supply companies) as industry executives recognize that outward-facing, complex, knowledge-based roles will be required to sustain and grow their businesses for the next 15 years.<sup>2</sup>

1. "Guide to the Business of Chemistry 2007," American Chemical Council, [www.americanchemistry.com/store/detail.aspx?ID=103](http://www.americanchemistry.com/store/detail.aspx?ID=103).

2. "Foresight 2020: Energy Industry Results," *The Economist* Intelligence Unit, 2006.

**Access to Reserves and the Rise of NOCs:** As a result of downsizing and rationalization driven by low oil prices during the 1980s and 1990s, IOCs outsourced much of what the industry considered to be “non-core” skills and capabilities, such as production operations. Skills considered to be core competencies, such as subsurface modeling and interpretation, reservoir management, and so forth, were kept in-house. Additionally, IOCs looked to the service and supply industry to provide the majority of R&D investment in oilfield technologies and the maintenance of skilled professional and operational resources.

One of the consequences of this restructuring of the industry, together with the location of oil and gas reserves, has been a shift in the balance of power toward the NOCs. In this highly demand-driven environment, traditional reasons for partnering with IOCs (access to capital, technology, and markets) continue to diminish. NOCs have developed in-house expertise and have access to technology through the service and supply companies, who are paid in cash rather than reserves. NOCs also are expanding along the value chain into downstream activities, such as refining, to ensure access to markets. Consequently, IOCs increasingly face the prospect of being offered access to high-cost or environmentally challenging (or both) reserves. As a result, IOCs are experiencing static or minimal increases in reserve/production ratios (currently 10 to 15 years for most IOCs), together with steady increases in finding and lifting costs.

Clearly, the worldwide oil and gas industry is at an inflection point. It is evident that the industry must find ways to make existing structures and boundaries more flexible to accommodate the dynamics of 21<sup>st</sup> century energy supply. Responding to these challenges, IOCs and service and supply companies increasingly will need to virtualize their capabilities, acquire and manage the critical knowledge workers they require, and interact more effectively with ecosystem players and stakeholders. IT and communications infrastructure will play a critical role in providing the collaboration and communication tools required for virtualization, while supporting the necessary organizational transformation.

## The Virtual Oil Company

### What Is the Virtual Oil Company?

Many experts have written about the need for, and benefits of, virtual organizations. The oil and gas industry has started to roll out collaborative environments and debate the necessary organizational and cultural challenges, usually as part of a “digital oilfield” initiative. There appears, however, to be an inconsistent view of what the virtual oil company looks like and which characteristics and attributes are required for success.

The virtual oil company minimizes or eliminates obstacles created by location, distance, and time. For example, a worker confronted with a problem in a remote African location can contact an expert in Houston and share well data, production information, and (increasingly) video to help explain and diagnose the situation. The worker can get immediate, expert advice on handling the problem. Or sensors down-hole in the Arctic can transmit real-time information to remote operations centers in Stavanger, Norway, allowing collection and analysis of data needed to make critical production decisions. Rapid sharing of information allows the virtual oil company to make faster, better informed business decisions.

The virtual oil company also fosters collaboration between various players in the value chain, including government and research institutions, which benefit from the creativity and innovation that collaboration can engender.

The enabler of the virtual oil company is the information and communications network that supports the knowledge worker. The network links all the disparate elements of the organization, no matter how remote, providing real-time access to people, data, and processes around the world. The boundary, or “edge,” of the organization becomes the down-hole sensor or the mobile maintenance worker, not the regional office or offshore platform. The development of “edge organizations” that support worldwide oil and gas activities will require robust, scalable, collaborative environments supported by seamless networks that integrate all communication modes, including voice, data, and video.

## The Ingredients of Virtualization

Virtualization requires an environment that incorporates the following elements:

**Access to Information:** Virtualization includes the ability to access the right information—in the right place, and at the right time—to make informed business decisions such as identification of business problem areas, resource allocation, and so forth.

**Establishment of Teams:** Virtualization requires transparency across the organization and, ideally, an ecosystem that identifies and combines appropriate skills and resources.

**Coordination of Activities:** Teams need tools and processes that support effective, virtualized coordination.

**Access to Organizational Resources:** Teams require technologies that enable virtualization. For example, geographically dispersed team members can use TelePresence to collaborate, solve problems, and share data when in-person meetings are impractical.

**Figure 1.** TelePresence Enables and Enhances Effective Remote Collaboration.



TelePresence creates a live, face-to-face meeting experience over the network—empowering users to interact and collaborate easily and naturally. Life-size, ultra-high-definition video images, CD-quality audio, a specially designed environment, and interactive elements combine to create the feeling of being in person, allowing participants in remote locations to develop the feeling of trust and teamwork that is the basis for effective collaboration.

**Motivational Factors:** As with other mature industries, the current success and challenges of the energy industry are a consequence of its history and culture. Geographical, organizational, and cultural fault lines inhibit the ability to collaborate and communicate effectively, both in real time and on an ongoing basis. Virtual organizations need to address these fault lines by actively changing the culture of the organization.

**Heterogeneity of Use:** Virtual organizations ideally provide universal systems and information access so that everyone is using the same data, workflows, and processes. This creates a shared understanding across the organization and facilitates communication and collaboration.<sup>3</sup>

## Transformation and the Petroleum Professional

Value creation in the oil and gas industry is based on the ability to interpret information, such as seismic, well, and production data, to construct useful reservoir models, which then are used to identify and economically extract oil and gas deposits. Interestingly, the IT workflows and organizational structures that support this value creation have changed little over the past 25 years.

3. "When Are We Going to Address Organizational Robustness and Collaboration as Something Else Than a Residual Factor?"  
V. Hepsø, Society of Petroleum Engineers, SPE 100712, 2006.

To enhance value creation in the oil and gas industry of the 21<sup>st</sup> century, organizations will require more effective collaboration and coordination of individual skills and expertise across all oil and gas professions and disciplines. Petroleum professionals spend a lifetime honing skills, accumulating experience, and developing tacit understanding of specific basins and reservoirs, or developing functional skills such as drilling or maintenance. Over the years, these skilled individuals have tended to “cluster” in key locations such as Houston, Aberdeen, and Stavanger, supporting local exploration and production activity.

Today, oil and gas companies must exploit deposits in remote areas such as deep-water basins off the west coast of Africa, the Russian Far East (such as Sakhalin Island), or under the Arctic ice. These locations are far from where a substantial proportion of the world’s oil and gas expertise resides.

Another issue is that the professional workforce is aging. Older professionals are understandably reluctant to travel long distances to these remote and often hostile locations. And as these highly skilled workers retire, there will be a shortage of replacements. Similarly many new graduates are expressing reluctance to work in these frontier areas. Consequently, there will be a requirement to bring business workflows and information to the professionals (and not to send scarce professional resources to remote and dangerous locations). In short, there is a need to create virtual links between every part of the operation.

Successful virtualization requires establishing effective collaboration, communication, and coordination infrastructures, both technical and organizational. In essence, the organizational culture must be reinvented to place value on the “three Cs” that support flexible operations. This requires agile teams that understand the benefits of sharing and cooperating with other teams, and can shift operations quickly, as required. To succeed at creating an environment of collaboration, cooperation, and coordination, there also must be a culture of trust. Creating and maintaining a culture of trust is a deliberate, ongoing process that enables these flexible teams to perform effectively.

It is necessary to understand the dimensions of the virtualization process. Companies considering virtualization must assess the following:

**Geography and Location:** Where are all the operations, and how can they be tied together virtually?

**Organizational Interfaces:** Where do boundaries and gaps exist? How can these be eliminated through virtualization or organizational change?

**Organizational Processes:** What works and what doesn’t?

**Information and Data:** How is data acquired, transmitted, analyzed, and used?

**Culture:** What needs to change and what needs to stay the same to establish an environment of trust, collaboration, communication, and cooperation?

Any geographically diverse company will encounter differences in culture and variations in local organizations. If the company fails to address these differences, they will lead to dysfunctional behaviors that only will be exaggerated by any technology. (As has been noted by many others, automating a problem just makes problems occur more quickly.) It also is critical to deal with the people issues related to collaboration. When processes are changed or modified, or when new technology is introduced, there always is a certain amount of resistance to change. People need to be brought on board with the change process and trained to use new technologies effectively.

## Integrating Intelligence

The development of virtual organizations that support worldwide oil and gas activities will necessitate robust, scalable, collaborative environments supported by seamless communication networks that integrate all modes of communication. Easy to say, but what is involved in achieving this?

Unifying multiple modes of communication supports the increased accessibility needs of global organizations. This is accomplished by merging voice, video, data, and collaboration applications—IP telephony, messaging, presence (users' location information and availability status), mobility, whiteboarding, and audioconferencing and videoconferencing—securely across desktops and mobile devices. When combined, these functions facilitate collaboration and communication independent of location.

The foundation upon which all these Unified Communications tools depend is an intelligent network that supports and enhances management of the virtualized organization worldwide. The intelligent network provides the infrastructure required for:

**Collaboration and Resource Virtualization:** Improves real-time collaboration; takes advantage of central and/or distributed expertise within the group.

**Sense-and-Respond Organization:** Supports remote/virtual activities such as right-time reservoir and asset management; provides ability to prevent platform/rig failures/problems; reduces operation downtime. Ultimately, enables fully integrated and remotely operated asset portfolio.

**Unified Communications:** Facilitates both primary work (the objective of the task at hand) and articulated work (work necessary to coordinate activities, resources, and so forth to achieve the goals of the task at hand); delivers effective coordination across disciplines and ecosystem partners.

**Work Environment (Offshore and Onshore):** The results of an integrated, virtual work environment are increased crew morale, reduced crew turnover, and improved health, safety, and environmental performance (HS&E).

The network is the one common component that touches all data, devices, people, and processes. Simply having a network, however, is not sufficient; it must be intelligent and able to act as a central nervous system, connecting every individual and function in the organization, while permitting collaboration and data sharing with the greater oil and gas ecosystem. The intelligent network provides for the human element. In the exploration and production business, critical decisions are based on the assembly and consolidation of knowledge as it is interpreted by people—people who need help visualizing potential solutions and outcomes.

### Virtualization: The Key to Globalization

Some oil and gas companies have made significant strides toward virtualization; others are just beginning their journeys. A recent study by Cambridge Energy Research Associates, Inc. (CERA) indicates that oil and gas companies have not yet realized the full promise of the virtual oil company: “to monitor and manage all operational activities in real time or near real time, regardless of location.”<sup>4</sup>

Though virtualization demands a serious transformational process and substantial investment in technology, the benefits remain compelling:

- Virtualization allows scaling of key resources and skills. Specialized expertise can be deployed anywhere in the world, combating the loss of expertise due to an aging professional workforce
- Projects can be staffed based on competency, instead of physical location, improving performance and outcome
- People can connect regardless of time, space, or organizational boundaries
- Asset usage increases due to increased field productivity
- Virtualization allows even smaller IOCs to establish an effective global presence

The dynamics of the energy supply are changing rapidly as old business models quickly become obsolete. Oil and gas companies that cannot adapt to the exigencies of ever-more-difficult extraction of hydrocarbons, the pressure to operate globally, and the increased scarcity of the industry’s professional expertise will have a hard time surviving. Oil and gas companies need to map how they will evolve to the next step, using the network as a platform for virtual, agile operations that respond quickly to global changes.

4. “The Digital Oilfield of the Future: Enabling Next Generation Reservoir Performance,” Cambridge Energy Research Associates, Inc., 2003.

Notes:



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### More Information

The Cisco Internet Business Solutions Group (IBSG), the global strategic consulting arm of Cisco, helps Global Fortune 500 companies and public organizations transform the way they do business—first by designing innovative business processes, and then by integrating advanced technologies into visionary roadmaps that improve customer experience and revenue growth.

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