Managing Knowledge Management

Oil and gas companies have varied approaches to sharing knowledge. Experts from six E&P companies discuss experiences in establishing knowledge-management infrastructures—what they've learned to date and what the future may hold.

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Moderator, **Reid Smith,** Vice President, Knowledge Management, *Schlumberger*.
Many companies develop knowledge management programs in response to key issues or a particular event within the organization. What business drivers are behind your knowledge-management efforts, and what are your companies trying to achieve through knowledge management?

Lesley Chipperfield, Manager of Organizational Performance, *Shell International E&P:*
Our start in knowledge management began with the major reorganization of Shell in late 1995 and early 1996 when we started transitioning from a group of globally dispersed companies that were not linked to a globally connected company. Before that, the companies didn't talk directly to each other, and if they did, it was through service companies. Reorganization mandated that we do things differently and required a cultural shift.

Many of the initiatives to start sharing knowledge were kicked off in 1996 and 1997. Management recognized that good things were happening and, in 1998, my group was formed to pull together these divergent, entrepreneurial knowledge-management efforts, which had actually fragmented us. Trying to leverage best practices helped establish our current direction.

Chris Mottershead, Technology Vice President, Lower Carbon Growth, Global Business Center, *BP:*
BP started knowledge management in the drilling organization in 1992 or 1993 with training and learning. The average driller must make quick decisions "on the go" and has considerably more personal accountability sooner than other disciplines. As a result, drillers seem more willing to ask for and accept help, and they are particularly receptive to new ideas. Like other companies, our organization was no longer centralized. People couldn't perform well unless they could engage their peers and get help that previously arrived with authority from the corporate office. They had to share information.

In 1994 and 1995, we started evaluating how to improve virtual teamworking (VT). A camera on every desk let you see the person you were talking and working with long distance. In the North Sea, we established pilot VT programs within business units like the Miller field area. Initially, the objective was to improve onshore and offshore communication. In the Andrew field business unit, we used VT to connect the various disparate activities of multiparty construction projects. Then, we connected the executive managers in our worldwide upstream business through VT to avoid regional isolation. This was remarkably successful, but once we got a global organization going, this type of hardware wasn't needed anymore.

Outside BP, knowledge management seemed to be grounded more in lessons-learned databases, which consisted of information that no one really wanted, hidden away in computer files that very few people knew how to access. We created a knowledge-management team in 1995 or 1996. Our chief executive thought knowledge management was important and still does, so it received much attention. For about two

years, this team did groundbreaking work to define knowledge management, look for best practices, particularly from the U.S. Army, and build relationships.

The strength and success of knowledge-management efforts depend on how broadly you build the network. In this case, it was quite extensive and included people with academic and practical experience. The end result was five or six knowledge-management nuggets that remained only with the 12 or so people on that knowledge-management team. When we merged with Amoco, differences between the two companies were so minor that it was almost surreal. They had 12 people in knowledge management; we had 13 or 14.

We thought there was a dangerous perception that the only people doing knowledge management were inside the knowledge-management team, and unless you had their help, you weren't doing knowledge management, which clearly wasn't true. With a staff of 25,000 technical people, most of the value comes from knowledge they apply daily. Believing that 12 or even 26 people were going to reach the entire technical staff was unrealistic, so we dispersed this team back into the business units in 1999. That strategy was successful because values and activities added by this team up to that point were transfused back into the organization. A group with two or three members from the original knowledge-management team was maintained to support the exchange of knowledge between not only different geographies, but other business groups as well.

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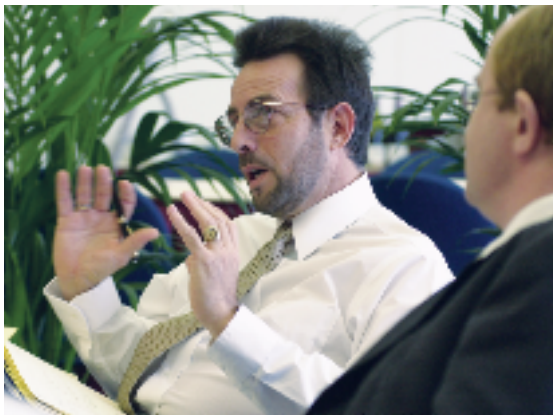
Rodulfo Prieto, PDVSA:
We like the term "knowledge" because it emphasizes the mental-creation phase of every project. It implies working at the highest level of technology to share data and information, and close any gaps in our professional competencies.



Jeff Stemke, Knowledge Management/ Collaboration Consultant, *Chevron:*
We got into knowledge management in the early 1990s as an outgrowth of the quality movement. The primary issue for us was cost reduction. We looked outside the company and saw that our cost per barrel was out of line. The idea of looking inside and outside the company for best practices grew out of quality initiatives to reduce costs. We identified some breakthrough quality projects that touched broad processes like energy and project management, refining operations and drilling and put teams together to tackle those initiatives. They did some wonderful work pulling together best practices.

For example, we developed a world-class project-management process. Our refineries went from six or eight regional fiefdoms to an integrated organization that understood the need for sharing operational knowledge. That work occurred from 1992 to 1995. We made progress and had success, but the results didn't stick because these efforts didn't focus on looking for and sharing best practices as the standard way of doing business. A good example was Year 2000 (Y2K) preparation. We had to look at embedded systems and understand their impact from a Y2K perspective. In a knowledge-sharing organization, you would think that various groups would pool their knowledge, but that didn't happen right away. It took some time.

We reached a plateau because knowledge management wasn't embedded in our business. Our new CEO, Dave O'Reilly, has always appreciated knowledge management, but he puts it in a different context by talking about five strategic intents for the company. Many companies have similar business strategies, such as operating excellence, cost recovery, capital stewardship and profitable growth, but he introduced a fifth, organizational capability—our ability to execute the other strategies. It includes learning from each other, reusing what we know and working effectively in teams. We're still defining the key elements of organizational capability, but they closely resemble the components of knowledge management.

Rodulfo Prieto, Exploration Project Manager, *Petróleos de Venezuela, S.A. (PDVSA):*
In the late 1980s, PDVSA started with quality and other issues that focus on business processes and sharing these processes, which was quite effective because it defined the workflow for many activities. Most of the time, geologists operate in the arena of mental creation. Mental creation is important, especially at the beginning of projects before commitments are made. When the three PDVSA affiliates merged in 1998, it was important to create an organization that combines technological competencies and information through what we were calling knowledge management. We like the term "knowledge" because it emphasizes the mental-creation phase of every project. It implies working at the highest level of technology to share data and information, and close any gaps in our professional competencies.

We got into knowledge management because we had so many projects going on that it was difficult to standardize them without limiting creativity. People know a lot, but apply only a small percentage of what they know and share even less of what they apply. It was important for us to capture this knowledge. Through knowledge management, leaders not only share experience and knowledge, but move ahead to create what I call "contamination centers" where people infect each other with ideas. This gives people visibility and an opportunity to say, this is good or this is not. In these centers, people are motivated to improve business activities and return value to the organization.

We developed an internal system called Project-Net, so that everyone can share best practices through our intranet. Everyone has

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Erik Åbø, Statoil:
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access to new applications, technology and, above all, information about how things are being done on exploration projects around the corporation. We have also had a knowledge-management manager since 1998. This position reports to the Board of Directors and is responsible for ensuring proper application of technologies and the sharing of best practices and lessons learned throughout the organization in order to maintain a high level of competencies.

Erik Åbø, Chief Engineer, Well and Production Technology, *Statoil:*
We got into knowledge management for practical reasons. Like other companies, we had decentralized and needed a way to transfer experience, share best practices and run networks. There also were an increasing number of projects with limited staff, and we didn't want people using the majority of their time just to gather data. When we talk about knowledge management, it's not just about communication and computer technology; it's redesigning the work process to increase efficiency.

And third, subsurface information, especially seismic data, was increasing exponentially because of advances in three-dimensional (3D) technology. We needed an easy, effective way to access corporate data, but many of the existing software tools didn't work together or didn't work in the same databases. To increase staff efficiency, we decided to establish a central data store, use a portfolio of tools that could interface and redesign the work process. Most of the computer tools that manipulate subsurface data now work on common platforms. For communications in the decentralized organization, we created an extranet, which is something between an intranet and the Internet, and includes suppliers and partners.

Reid Smith, *Schlumberger:*
Almost a decade of working to establish knowledge-management infrastructures has obviously provided a wealth of experience and lessons learned (see "Lessons and Nuggets," *page 72*). What business problems have you addressed, and what approaches—communities of practice, networks, capturing and reusing best practices, lessons-learned databases, knowledge repositories and portals—have you tried?

John Old, Focus Area Leader, Information Management, *Texaco:*
Our strategy focuses on connecting people. We've done all those things to some extent, but now Texaco emphasizes networks. One of the factors for a successful network or community is a leader with energy to keep the group going. We deliberately created a network for knowledge-sharing activities. It is composed of people from the business units who have a passion for knowledge management. Twice a month, we get together, talk about what people are doing and what needs to be done to create and sustain knowledge-management energy.

Our general engineering group, which focuses largely on the downstream business, has a database repository of best practices, or million-dollar stories, which are very good and actually entertaining to read. They probably get used more frequently than other databases. Knowledge-management tools like database repositories should be connected to people. If you capture best practices, you should use them as a means of pointing out the right people to talk with when you face a problem.

Lesley Chipperfield, *Shell International E&P:*
We've also used many approaches, but within E&P, we focus on people and people-to-people connections. Perhaps this is a reflection of the E&P business where personal contacts are so important. For a given topic, we can search our intranet and get

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500 hits, but if someone recommends one, it has more value and credibility. The people you connect with may direct you to a report, but that report now has a personal reference. We have a slogan, "Knowing who is as good as knowing how." Our primary and most successful knowledge-sharing solution for promoting people-to-people connections is the networks that were initially established among the technical communities.

Although we have moved away from concepts like central, formal best-practice repositories, some communities use them if that suits their style of working. On a global basis, most of our staff is connected, at least indirectly. You can pose a question on the intranet and get an average of two or more replies. At least 75% of our technical professionals belong to one or more networks. We call them global networks, but they could be called communities of practice. It's interesting that in BP, knowledge management began with drilling because in Shell the wells group also started it first. We thought it was because of a few energetic individuals, but it may have more to do with the nature of drilling and completion engineering work.

Our three big technical communities are wells, subsurface and surface, but these global networks were actually formed by merging 70 or 80 smaller discipline and subdiscipline groups. We looked at what the wells network had done, which was build a bigger community by drawing disciplines together, and tried to replicate that in the subsurface and surface networks. Many of our business networks cut across all disciplines and supplement the technical networks. We already have networks for knowledge-sharing and competitive-intelligence as well as another critical cross-discipline network for procurement, and networks for benchmarking, human resources, safety and environment are just getting started. We're trying to reduce the number of networks that individuals must belong to in order to access the expertise they need.

Chris Mottershead, *BP:*
We draw a clear distinction between communities of practice and communities of interest. Other than making sure they have resources, we do not control communities of interest, which are created by people because they identify with them. That's the larger number of communities. For example, there's a 3D geophysical modeling community, but groups like this are not managed in any real sense. People join communities and participate because they have common interests. What we strive for is community ownership.

There is some degree of oversight and assurance to make sure that there are working networks in areas where we must deliver against specific objectives, which are important to the company. Within the wells area, for example, there are five or six communities of practice organized around themes like nonconventional wells, stuck-pipe prevention and deepwater drilling where, in a sense, there is self-regulation. If you have a major role in these areas and you're not in a network, someone may pointedly ask, in terms of accepted practice, why you don't participate.

Connecting people was a factor in taking our knowledge-management team apart and putting it back together later. We started knowledge management by promoting networks, but in our organization, the networks probably didn't initially get captured within the formalities of knowledge management. This is one reason we were uncomfortable with a central knowledge-management organization because people started to rely on that group to construct knowledge assets. As a result, we pulled back and moved closer to what Shell and Texaco are doing—connecting people.

There were parallel efforts because we had a lead person in knowledge management and one for engineering codes and standards, and they were on the same team. There was no one else on

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the team; everyone was doing his or her regular job. There may have been committees, but there was no central engineering department to say that something was right or wrong. Because we had similar approaches in knowledge management and explicit codes and standards, we tried to bring those two things together by constructing a model with four types of organizational wisdom—everyday practices, shared practices, good practices and recommended practices.

There was wisdom represented by practices that are used every day somewhere in the company. There was wisdom from shared practices that result from connecting people. You may ask someone for explicit help, which is similar to accessing a report. You're not as interested in the report itself as in the name on the report. Therefore, much of our networking involved ways of connecting people through tools like Schlumberger Connect Oil & Gas. Then from shared practices, you eventually make tacit knowledge into explicit knowledge, which we call good practices. The typical example is codes and standards. They're not right or wrong, but if you want a turbine, here's how you procure and install it. An expert user probably takes best practices and does something different, but you can just use a good practice if you don't know anything else.

The fourth type of wisdom is from recommended practices, which are actually just expectations, not definitive answers. They are questions you ask rather than answers you seek, which forces you to cascade back down the chain just by getting two people together. The real added value goes back to where it originated in a shared practice, but the process is structured in a way that connects disparate things together.

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How do you connect people to the things they need to know to do their jobs through problem-solving, knowledge-sharing and innovation? Do you have different types of networks or communities? How do the business units use them? How are they organized and what support do they have?

Rodulfo Prieto, *PDVSA:*
Our production and exploration communities developed in different ways. In the production business unit, communities act as centers of excellence. They validate, certify and provide support for decision-making. Most production projects will have members from the community consult on the project when an important benchmark is being discussed. This process is mandatory.

In the exploration business unit, we have a community of interest where people participate by choice in their area of specialization. There is dual citizenship in the sense that you're part of a project, but you also belong to the exploration community at the same time. The project has the option to consult with the community if necessary.

We don't have a unique structure for communities. For example, there are communities of interest that developed on their own like the geophysical group, which organized an informal weekly forum within the company to share knowledge. We support these communities and this type of communication between members as well. Communities ask for budgets when they want to do something. In exploration, communities are funded through various projects or technological groups under the knowledge-management department. I'm interested in how funding and budgeting are done in other organizations

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Lessons and Nuggets

Management push is necessary to get through the valley of pain on the way to the summit of gain—**Erik Åbø,** *Statoil*.

The greatest challenge in creating a knowledge-sharing culture is coming to the realization that sharing knowledge saves rather than consumes time—**Lesley Chipperfield,** *Shell International E&P*.

Successful knowledge management must engage everybody in the organization. It is not a central activity that collates and validates a corporate encyclopedia of subject-specific knowledge or knowledge-management processes. Having a central team means that you may rely on it too much. Knowledge management is not an encyclopedia, but rather a recipe book to start people talking. Knowledge management is a consolidated tool for the disparate learning throughout the organization, but it is not a definitive answer. It is a creative tool that people use to invent their own answers, informed by and armed with the experience of others. Fundamentally, this is knowledge management of knowledge management—**Chris Mottershead,** *BP*.

When members of a group, team, network or community understand the individual communication preferences of each person, and their responsibility to communicate in ways that match those preferences, the effectiveness of the whole group improves—**John Old,** *Texaco*.

Our biggest challenge is to have a corporation with organizations, teams and individuals that apply what they know and recognize what needs to be learned or unlearned to improve cost and risk assessment, and reduce project cycle time through integration of all available information—**Rodulfo Prieto,** *PDVSA*.

The biggest challenge is to create and nurture a knowledge-sharing culture in which people share knowledge and learn from others as a matter of course. They see it as simply the right thing to do—**Reid Smith,** *Schlumberger*.

We must provide connections between individuals who seek and supply problem-solving ideas and experience, and those in a community who share experience and reuse practices for personal professional development, corporate learning and innovation. We also need to connect people with explicit knowledge by making it easier to tap into the growing volume of documented practices and lessons learned.

As chief knowledge bee, I travel around cross-pollinating the organization by picking up ideas and practices in one location and spreading them to others. Occasionally, I help a team develop or use a knowledge-sharing tool or process and leave some "honey" behind. I realize that it takes time to redesign the "hive," so I use honey rather than a sting to induce participation—**Jeff Stemke,** *Chevron*.

Lesley Chipperfield, *Shell International E&P:*
One of the roles of my group is to help networks get funding, but value propositions come from the networks. We can help, but networks have to make a case for their existence. However, because networks are now such an integral part of the company infrastructure, we've moved past the point where groups must start from zero. Ask if we could do away with networks, and people react in horror because they wouldn't have sufficient resources. We rely on picking up practices from others rather than finding them ourselves. The network organization is completely informal.

We have a combination of common-interest networks and communities of practice. There are a few exceptions, but people are not obliged to belong to these networks and communities. They get involved because they want to contribute. In the early stages, people would ask, "How do I find time for networks?" I haven't heard that for quite a while. The first year, I got calls to budget for the hours people spent networking. That problem has also gone away. People see networks as a valuable resource because they simply make sense. Now we budget primarily around people who actually manage knowledge and networks, mostly out in the business groups. In my group, the minority of our knowledge-management budget is spent to facilitate and support best practices.

People were beginning to ask, "If you have a line role, why aren't you active in a network?" We, therefore, started appointing global consultants—individuals who are experts in a specific area, but may work anywhere in the company. They are listed in an expert directory. It's an elite club, so we don't call it Yellow Pages because not everyone can join. You have to be nominated and approved. These individuals are expected to be active in their networks, but they also are expected to contribute to other networks on an exchange basis and can do work for other companies if invited to do so.

John Old, *Texaco:*
That's similar to the Texaco Fellows program. It has separate funding and members are expected to contribute globally.

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Erik Åbø, *Statoil:*
To handle funding, we establish discipline advisors whose job descriptions include running networks. This position is based on the need for a network in a particular area. These individuals are used in more or less the same way as global consultants. Those who contribute to networks are also contributing to other projects, but because of advances in communications and computers, the time they actually spend running networks is minor.

Lesley Chipperfield, *Shell International E&P:*
A number of things can be done, depending on the roles of people and networks. Our wells community has regular teleconferences and face-to-face meetings between coordinators around the world to discuss issues. We don't have discipline advisors anymore, so networks grew to fill the gap that was left when we reorganized. The operating units are more asset-focused, so we don't have strong disciplines anymore. Because of the way the organization evolved, people maintain their discipline affinity primarily through participation in networks.

Chris Mottershead, *BP:*
We started rebuilding and repopulating the knowledge-management group under technology vice presidents rather than discipline leaders. We felt that after five or six years of letting knowledge management develop independently in areas such as drilling or project management, we were starting to lose value and needed to change again. Now, we have moved back to a system with discipline leaders. The question is always, "What's the next step that's needed to address the gap you're trying to fill?" But once you fill that gap, you'll probably want to do things differently.

John Old, *Texaco:*
That touches on the fact that there's growing recognition in all types of industries and companies that the only sustainable advantage a company has is how people work together. That's something no one can copy, unless you take over the other company and maintain complete control, which is not likely to happen. Thinking about how we get people to work together in uniquely different ways is the direction many companies are taking. This rise of communities is just the beginning.

Jeff Stemke, *Chevron:*
The most successful communities, like our best-practices refining networks, have defined business goals, clear sponsorship from senior management and a dedicated coordinator. In our case, a person, called a master, has full-time responsibility to collect knowledge throughout the refining organization for a particular process. That's also the model we're applying in the upstream area.

At the other extreme are informal communities where there's no leader, just a group of people who get together. They may have teleconferences or meetings occasionally, but there is no formal process for sharing knowledge. These groups are valuable only if you happen to know the community. If you aren't connected to it, you don't know that it's out there and have no legacy to tap into and get started.

We now recognize that networks need a coordinator. This position is funded or we recommend highly that it be funded to the extent of 10 or 20% of a person's job, depending on the community size and activity. We have not been totally successful in making the communities vital. There definitely needs to be some executive sponsorship

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and specific deliverables or metrics that the community strives to achieve and that people can measure. In this way, communities know they're on track and others can see what they have achieved. This hybrid model is summarized in the recommendations for successful communities from a best-practice study report, titled "Building and Sustaining Communities of Practice," by the American Productivity & Quality Center (APQC).[1]

Reid Smith, *Schlumberger:*
It's important to understand a community's responsibility. Every community does not have to have quantitative goals, but if it doesn't have something to strive for—a road map, a vision, some goals—as suggested earlier, the community may break up over time. I also see evidence of community members being unhappy when they don't understand why we are doing knowledge management. Chris, I understand that BP technology vice presidents are now responsible for marketing, licensing and selling communities to make sure that results are utilized in other parts of the company.

Chris Mottershead, *BP:*
Yes, that's correct. During the 1990s, our refining networks were similar to what we're talking about. For example, there was a maintenance network, or task team, but it in no way managed the collective wisdom of people involved in that activity. Instead, it dealt with how to make maintenance less expensive next year than this year. These teams were called networks, and their focus was explicit, but they weren't building a knowledge repository. The next level is networks of practice, where technology vice presidents are given accountability to make sure disciplines are healthy and people can do their jobs. These networks not only deliver today's results, but also build for the future. In some sense, communities need to be accountable.

We gave communities more visibility and rationalized them in the same way as Shell because there were too many and we couldn't maintain good control and oversight. We needed to reduce the number of communities and give them clear deliverables. We decided which networks or communities were needed to help transfer knowledge. These were based largely on people knowing each other, which is similar to the way people validate information by the name on a report and then start to recognize it as reliable.

Sometimes, to believe that the message is a piece of wisdom rather than an individual preference or prejudice, users need to look the messenger in the eye. This emphasizes the importance of a spectrum of knowledge-sharing activities, from explicit knowledge in repositories to getting people together in one room every year or two. You need to do all of these things.

John Old, *Texaco:*
About a year ago, we wanted to get the leaders from various communities together. At that time, if we talked about networks or communities, it didn't get much attention. But lessons learned was a term everyone was using and wanting to hear more about, so we held a lessons-learned summit, and got the community leaders together to talk about what made networks work and what didn't.

The same things that came out of the APQC best-practice study, like an engaged leader and a clear business purpose, were at the top of the list. Knowledge-sharing groups need to have a clear business purpose or measurable objectives such as improving the reliability of rotating machinery, which is one of the most successful Texaco networks. What's in it for the individual has a strong influence on network success. If the people themselves don't personally get a lot out of a network, it's almost always unsuccessful.

Lesley Chipperfield, *Shell International E&P:*
A clear business purpose is important, but it changes over time, sometimes quite rapidly. Networks have to continuously and effectively review their core purpose. We have many strands running in our networks. For example, you might have improving reliability as a specific theme, but with other themes running in parallel. We have a continuous theme of networks being the place to

1. American Productivity & Quality Center (APQC), Houston, Texas, USA. [http://www.apqc.org]

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seek advice, which is tremendously valued by the organization. In some ways, our networks are modeled around "good-old-boy" networks. I often describe it as letting the "new guys" into existing networks quickly.

What we do now is register people for a home network when they attend training by having a short module or an opportunity to explore the networks. We're trying to address the time required for people coming into an organization to climb the steep learning curve of knowing who can help. That's a powerful thing.

Measuring time to competency as a metric is something we're working on. You can't necessarily bring everyone to a training center, and experts may not be located where learning is taking place. In the future, we will use networks as a direct tool to support training programs, and as a tremendous resource for learning.

Reid Smith, *Schlumberger:*
We try to apply everywhere what we learn anywhere. The Schlumberger InTouch system helps ensure that field engineers have access to the best available knowledge. There are about 165 full-time InTouch engineers staffing 75 help desks. If you can't find the answer on a knowledge platform, you go to this help desk. Whether you send e-mail, connect through the Web or call on the telephone, it's their job to find the answer. Sometimes they go directly to the people in a community who are responsible for validating information.

We learned a great deal about validation from Chevron. Validation of information is an extremely important issue and one of the things that differentiates the style of network. How do your organizations validate information? Do most communities make decisions, or do they just advise?

Rodulfo Prieto, *PDVSA:*
When communities make decisions, they may "gold plate" things to protect themselves. Gold plating is sometimes common in seismic interpretation and drilling. In 3D seismic surveys, interpreters often want to do high-resolution sequence stratigraphy and evaluate every line of data, which may add minimal value compared with interpreting every other line, but in terms of people and time, costs can double. In drilling, however, it may be important to evaluate several different scenarios to determine the safest and lowest cost option.

There are different types of communities: some advise; others make decisions. In our exploration organization, project members consult with communities on an as-needed basis for specific situations. However, the added value of various solutions presented by the communities must be taken into account, so project leaders and team members discuss the recommendations and decide which approach is best.

Erik Åbø, *Statoil:*
I have an example that illustrates business objectives and addresses concerns about gold plating. When our well-intervention network gets together, they see the Key Performance Indicator (KPI) relating to their network. A KPI that we use in well construction and well intervention is cost per foot or meter. Coiled tubing is often expensive and risky to use. A well tractor is expensive enough, but costs less than coiled tubing. Therefore, engineers try to use well tractors because they want to see the KPI going in the right direction.

This is a good approach because the manager doesn't decide whether to use coiled tubing or a well tractor. The program engineer decides. He's the one who goes to network meetings, sees the improvement and gets ownership of the KPI. It's important to link key performance indicators to technical networks. As an engineer, I like gold-plated solutions, but I also like to see improvement in the KPI because we are all competitive.

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There are different types of communities: some advise; others make decisions.

Jeff Stemke, *Chevron:*
We have good ideas, good practices, local best practices and industry best practices. There were definitions associated with this validation concept, but there wasn't a clear process. If I put something into a best-practice site because I did it and it worked for me, that's the first level of qualification. But how do I validate information in a community context? We don't have people dedicated to validating concepts like those in the Schlumberger InTouch system, so the idea is to use other members of the community for validation because they can say, "I tried that and, in my circumstance, it worked." This does two things. First, it validates the idea, and second, it establishes behaviors around not just sharing, but reusing, knowledge. I'd like to know if anyone else is using this type of validation concept.

Reid Smith, *Schlumberger:*
That's exactly what the engineers staffing the InTouch help desks do. These engineers come directly out of the business segments. This community of people finds and validates information or solutions. It's part of their job. They are the network.

John Old, *Texaco:*
It also sounds like what other companies, Electronic Data Systems (EDS) for example, do. The first level is "I've tried something and it worked for me in my local situation." The next level is something that's been applied in a number of business units or different situations, so it's worth looking at to see if it's applicable in other areas or across the company. Then, if these things apply everywhere, don't ask questions, just go do it. It's the same as in the Schlumberger InTouch system.

Lesley Chipperfield, *Shell International E&P:*
As far as validating best practices, in general, our communities validate. We have a number of so-called best-practice databases on the Web sites. Some exist within networks and others are in document-management systems, so they're pretty diverse. Practices that are reused the most exist in some way within the networks. These practices are generally flushed out because somebody asks a question. Usually, there's already a demand before the practice is captured. Best practices don't necessarily originate because someone's proud of something they've done. They originate because someone asks a question and someone else offers the practice as an answer.

Then you get other contributions from the community such as, "There's a better idea or, under those circumstances, that won't work; this might work better." One of the roles of our funded network positions is responsibility for closing out those conversations and capturing that knowledge nugget. Those nuggets can then be filed where they are easy to access. This process works better in some areas than others. Realistically, it does require a truly knowledgeable network moderator to understand the conversation and the quality of the proposal, and what should happen next.

Reid Smith, *Schlumberger:*
If I'm not mistaken, Shell has dual axes. One axis is the formal project or organizational hierarchy and the other is more discipline- or community-related. The horizontal axis is a cross section of the company that some say more closely represents people's careers as they move through a variety of jobs. Do you see networks or communities playing a role in career development as well as in meeting knowledge-management objectives and providing the other functions we've discussed?

Lesley Chipperfield, *Shell International E&P:*
In the mid-1990s, we established an internal open resourcing system. Shell was emphasizing that it was the individual's career. There is no central staff looking after individual careers, but career advice is available through Skillpool Managers. Each of the technical networks addresses skill issues—the Learning & Development staff uses them to identify new offerings. Network participation is instrumental in building technical reputations and, therefore, indirectly in career development.

John Old, *Texaco:*
We don't have explicit discipline networks, unless they arise around some clear business purpose. The competence of the discipline is only indirectly identified as a separate business purpose. What we have in the upstream business is a network of resource advisers, a group of people who are responsible for ensuring that people are aware of job openings where their expertise is needed and that there is equal opportunity to get jobs throughout the company. This is a higher level network that helps people with assignments and technical competence.

Rodulfo Prieto, *PDVSA:*
We also have two axes to address technical development. In addition to the previously mentioned communities of interest, we have a technical resource department that is responsible for developing people and assigning them to different projects. The leaders of each technical line usually participate in one or more communities and promote forums on specific issues within the technical line. They also are responsible for closing competency gaps as well as the development of all personnel. In exploration, we have seven technical lines—geochemistry, seismic

interpretation, stratigraphy, integration, structural geology, petrophysics and reservoir characterization—that come together because of common interests. We probably need to integrate those communities into one.

Erik Åbø, *Statoil:*
We've discussed the efforts of technical disciplines, but we also have what we call process networks. Discipline advisors run technical networks, but vice presidents run process networks. For example, there are several networks like exploration and reservoir development, drilling and well technology, development concepts and projects, project management, purchasing, and finally, operations and maintenance. Historically, vice presidents had a central staff development function, but we now have totally free access to jobs. The networks do not have a formal decision-making capacity, but facilitate sharing of best practices and make sure that the best people with the right competency levels for the future are in staff positions. Senior managers run these networks.

Reid Smith, *Schlumberger:*
Conventional wisdom is that you shouldn't spend more than a third of your knowledge-management budget on technology, but technology often seems to be the focus. Companies use a variety of technologies such as e-mail, people finders, Yellow Pages, discussion forums, portal software and other collaboration tools. What are your experiences with knowledge-management tools and technology and what has worked for you?

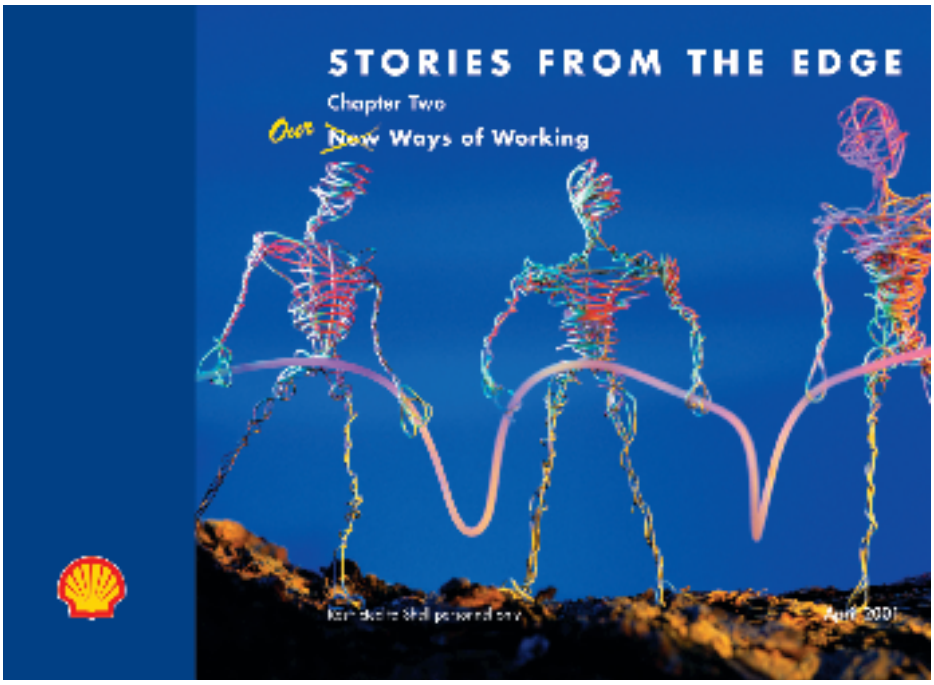
Lesley Chipperfield, *Shell International E&P:*
Our experience is that we frequently have to persuade new communities to address other issues instead of jumping into technologies before the needs are clearly defined. Managers or people involved in networks often have a technology they want to use. People hear of a new collaboration tool and want to implement it before the objectives are defined. Our strategy is to focus on people and processes first, enabling them with a small range of tools from e-mail to more elaborate collaboration projects, tools and Web-site space.

Jeff Stemke, *Chevron:*
We want to leverage available technology, so it is important to have an established profile, or visibility, with those you are trying to help, especially when vendors present new technologies that will "solve all their problems." In large companies, a team or community often hears about a new tool and wants to implement it. A better approach is to look at what a group is trying to accomplish and match technologies with those needs. If a group knows you, or you know the members, you can ensure that what's happening makes sense.

In our experience, many of the knowledge-management technologies are collaborative, Web-based tools like Lotus Domino or QuickPlace for discussions and document-sharing, and real-time application-sharing and video-conferencing tools like NetMeeting or SameTime. Expertise directories are a kind of technology-supported, Web-based solution. In drilling, we worked with a consortium of companies to produce Get Smart, which is a Microsoft Project-based template for drilling. In terms of relative investment and participation in the process, I agree that the cost of tools should be much less than the "people cost." It's more important to focus on the business problem and then match up technologies after a team decides what they are trying to do and how information needs to be transferred.

Lesley Chipperfield, *Shell International E&P:*
It used to be that if we wanted global linking or the potential for it, our greatest challenge was avoiding fragmentation from local selection of technology. We ask groups to think about where they are going next and where they want to be in the longer term to avoid isolation from other communities. We prefer the simplest tools with the lowest possible entry level in terms of people using them. The more features these tools have, the more difficult they are to use. We opt for simple tools and standard products like SiteScape and NetMeeting to keep collaboration as simple as possible.

One of the interesting problems about technology is that the network moderators from our technical disciplines have backgrounds in the business units rather than information technology (IT), but they often end up talking about knowledge-management tools and technology when we have meetings about where the networks should go next. There is always a huge effort to maintain a balance between putting our energy into looking for new tools and developing better features or making better use of what we have, and I think it will always be that way. It has something to do with being in a technical company where people like to try out new technologies. My group sees minimizing fragmentation and increasing potential for future connectivity, even if it isn't obvious today, as key roles we can play.



^ Communicating best practices: the Shell *EP Newsletter*. [Courtesy of Shell International E&P]

Knowledge Management Is…

…creating an environment for sharing information and practices to attain corporate business goals—**Erik Åbø,** *Statoil*.

…connecting people so they can share expertise globally—making the best resources accessible to each business opportunity at the right time, regardless of organizational or geographic location—**Lesley Chipperfield,** *Shell International E&P*.

…about keeping track of those who know the recipe, and nurturing the culture and the technology that will get them talking. It's not about creating an encyclopedia that captures everything that anyone ever knew (Arian Ward, Work Frontiers International)—**Chris Mottershead,** *BP*.

…helping people effortlessly connect to the individuals and artifacts they need to achieve their personal and business objectives—**John Old,** *Texaco*.

…creating a corporate culture where our people become the main driver, so that information is captured, documented, shared, applied and even renewed in order for the right person to use it at the right time—**Rodulfo Prieto,** *PDVSA*.

…creating a new working environment where knowledge and experience can easily be shared, where individuals apply collective knowledge to make optimal decisions in real time—**Reid Smith,** *Schlumberger*.

…a knowledge architecture, or process structure. The key elements are processes, technology and behaviors that deliver the right content to the right people at the right time in the right context, so they can quickly solve problems, exploit business opportunities, accelerate competency and innovation, and make the best decisions—**Jeff Stemke,** *Chevron*.

Jeff Stemke, *Chevron:*
A few years ago, one of the things we implemented was a standard global desktop. Everyone now has the same software and basically the same hardware. This was primarily a cost-cutting initiative. We were supporting so many different kinds of software and hardware that standardizing saved about $40 to 50 million a year. We now use the same versions of word processing and spreadsheet software, so many of the file-sharing barriers have disappeared. An intangible benefit is that collaboration is now easier.

In the early 1990s, we had group software wars with one team using tool A and another team using tool B. Now, we are developing the mentality that common is good, but that attitude hasn't completely taken hold. There isn't a corporate collaboration standard yet, but we're working on one. To achieve truly global communications, we need to make it easy to connect with others inside or outside the company who are using the same processes. Then, when a new tool comes along, you can compare it with the existing infrastructure to look for added value that justifies its use.

Erik Åbø, *Statoil:*
We switched to a common platform a couple of years ago. It was pain before gain, but when we say common platform, it doesn't mean the same supplier for all tools. A good supplier is able to supply tools that link to any platform. Open standards are important for the future. There is competition between service companies for their platform to be the industry standard, but even larger service suppliers should be willing to cooperate with other companies to make sure that as a business we are operating on an open standard, regardless of subsurface tool constraints.

One of the things we did was to tell people that this transition was going to hurt. We made them aware that a difficult period was coming. Because they were unfamiliar with the new tools, some people thought the old tools were better and could do more. We told everyone that switching to one platform required tools that fit that platform. After a time, geologists, geophysicists and engineers have become comfortable with the new tools. We now are past the pain and into the gain period.

John Old, *Texaco:*
We spent about five years trying to get business units to agree on common E&P computing standards. Finally, a senior upstream vice president said, "We're just going to do it." The other thing that helped was getting some key geoscientists in the company to testify that it really doesn't make much difference what tool you use. They may be different, and you have to learn them, but once you do, it's easy to switch. Once that message started coming from credible people in the organization, most of the resistance ended.

Reid Smith, *Schlumberger:*
In a broad context, knowledge-management projects seem to turn into electronic-, or e-, business projects over time. Everyone starts with procurement and commerce, but I'm including internal as well as external e-Transactions with employees, partners and suppliers. There are many reasons for this. One is that over time, we realize that the knowledge we use comes from an extended enterprise that includes not just one's own company, but also partners, suppliers and academic collaborators at universities. The second reason is that much of what we learn is of value to our customers and suppliers as well as our own employees. The third reason, which is probably the most practical, is that it is expensive to construct knowledge assets in communities and networks. By making these assets multipurpose, we realize a better return on the investments made to construct them.

Some of your companies, Chevron for example, are very advanced in e-Business. Are your e-Business, e-Commerce and knowledge-management efforts linked? If not, should they be?

Jeff Stemke, *Chevron:*
Our CIO would not differentiate e-Business from knowledge management because he says that e-Business is the only business. Instead, we talk about being Internet ready. Basically, our businesses need to work globally to effectively enable us to connect with partners, suppliers and customers. A part of that effort encompasses traditional e-Commerce and e-Business; another

part includes collaboration through knowledge management. In that sense, making the company effective using the Web for all the things that need to be done, at least where practical, is the direction we're going.

There's definitely aspects of e-Business and knowledge management to the Chevron Business Electronic Support Tool (C-BEST), which combines our on-line lubricant advisory recommendation system with a mechanism for customers to monitor financial transactions. This tool helps customers select a product or recommend a competitive alternative to what they might already be using in their operation.

The Chevron Retailers Alliance (CRA) is a network of 8000 service stations, which generally are independently owned. Because many have convenience stores, we had the idea of connecting them as a cooperative buying group to reduce merchandise cost. The knowledge-management aspect is actually a help desk that allows service-station owners to call in and raise issues or ask questions. The CRA group knows where to go for answers and makes sure things get done. They don't call it knowledge management, but it fits the definition.

Lesley Chipperfield, *Shell International E&P:*
You could say that e-Business is the only business because almost everything is done electronically. Our e-Business organization is separate from the IT organization and my group. But because of its state of maturity, that's actually quite healthy. It's anybody's call at the moment, but we do have links. In fact, a member of my group is working on the e-Business team, so we're using knowledge-sharing as an e-Business driver.

We will use our experience with knowledge management and best practices to work with the e-Business team on a people-to-people basis rather than trying to link the organizations, which is always a struggle that leads to the software-related wars that we talked about. That's the direction we're taking, and I fully expect knowledge management to be a key part of any e-Initiatives.

Rodulfo Prieto, *PDVSA:*
Like many modern corporations, PDVSA uses e-Business extensively throughout the organization. The Bariven affiliate of PDVSA uses e-Commerce to integrate business processes and technology to eliminate internal and external barriers, and create added value by taking advantage of market opportunities. Our international marketing group also applies e-Business in trades by substituting Internet transactions for telephone calls and faxes. For e-Learning, the PDVSA Educational Center conducts 20% of all training on the Internet. We used e-Business to share data with private investors during the opening up of the Venezuelan oil industry.

The e-Transaction is also important internally. We are using e-Business with software applications that are controlled directly by another application to establish user times and charges in real time. We also have contracts that people sign to run projects, which are documented by e-Transactions. If you assign a person to a project or you're going to be doing something specific for a project, you execute an e-Transaction and sign it electronically, which is a different level of e-Business that we use.

Erik Åbø, *Statoil:*
We have a project under way on e-Business or e-Commerce, e-Collaboration and e-Learning. First, you have e-Commerce, the contractual part and daily business of buying or selling. Then there's collaboration through our extranet where different suppliers and partners are involved. It's important for our suppliers to participate in internal discussions on the extranet where there are private chat rooms for different organizations to access. If we have a contract or technical project with Schlumberger, Halliburton people can't go into that chat room. There's a high grade of security and strict regulations in terms of firewall principles. The other part is e-Learning, which is basically internal.

In addition, about three years ago, we had an internal e-Learning process called the IT step. Everyone in the company got a personal computer at home. General training was done in their spare time using CD-ROMs, which saved time and probably offset the cost of the computers. We're going to take this concept further because e-Learning will be very important in the next IT step within Statoil.

Chris Mottershead, *BP:*
Last summer, BP and Shell collaborated on e-Learning. What Shell is trying to achieve with e-Learning is impressive. It is not based on reducing training costs and shared practices of the moment, but rather on building a competent workforce for the future when that workforce is increasingly global, with little likelihood of ever being centralized again. Shell is addressing this in terms of how to produce a skilled organization for the next decade. By contrast, much of what we've talked about in knowledge management is how to respond to immediate needs.

It struck me that we have high-level, collaborative tools, but they're all about driving efficiency. What you actually want to do is improve the quality of person-to-person relationships. We set targets of having 99% of procurement transactions automated by the end of 2000 and are disappointed that we only got to 97%. We are victims because we missed by two percent. Shell's approach shows a great deal of insight about the things that should be managed.

Reid Smith, *Schlumberger:*
What successes have you had? What were the stumbling blocks and barriers? What are the metrics that you use to measure knowledge-management progress?

Jeff Stemke, *Chevron:*
The metric that made the most impact is bottom-line savings. Our goal was to reduce operating costs. In the past eight years, we have reduced operating costs by over $2.5 billion a year, in part through the successes of some of our early breakthrough best-practice-sharing knowledge-management projects. Knowledge management played a role in putting better processes in place to operate refineries, manage energy and run capital projects. The connection between knowledge management and cost savings is tenuous. While it is difficult to make a direct connection, these kinds of results helped validate knowledge management to the point that perhaps detailed cost justification isn't as important for new initiatives.

On the other hand, what I see in our communities is that without some metric that connects to the business, you may not get the results you want. You can, for example, use metrics for a number of different things. In a problem-solving community of practice, the metric could be the number of problems resolved or the number of responses to questions. If your goal is to develop and deploy best practices, what is the evidence that you're reusing them? We may struggle with the metrics, but it's clear that you've got to have something that connects closely to the business objectives you're trying to achieve.

Lesley Chipperfield, *Shell International E&P:*
To some extent, we've been able to move away from hard-dollar measures for knowledge-management activities over the last couple of years. Initially, we had to provide quantitative proof of value, but now we've moved more toward value propositions, or proposals, which can have qualitative elements. Last year, we reviewed all the so-called new ways of working as part of our pursuit of excellence program. Along with the

consultants in our global networks, we did a formal value review through interviews with people who collect data. Interestingly, knowledge management saved more than $100 million a year.

That feedback gave our leadership a feeling of comfort, and it also gave our group a great deal of confidence. However, what we found most useful were the best practices. We developed these success stories called "Stories from the Edge" for distribution with our internal technical magazine the *EP Newsletter*, which is circulated to 12,000 staff members worldwide to raise awareness of what is going on in the business. That was enormously helpful and we got tremendously positive feedback.

That publication was distributed almost a year ago, and now the second installment subtitled "Our New Ways of Working" is ready. It includes new stories and corollaries to previous best practices. We found this to be extremely effective in terms of persuading doubters. Our managers are among the best advocates of what we're doing in knowledge management and use many of these stories in internal and external presentations. These stories also are used in other publications and presentations, which illustrates that our commitment is paying off and is helping to legitimize knowledge management within the company.

Chris Mottershead, *BP:*
If you want to be successful, then the way you say it has to be authentic and true to what you say. If it's not, people become uncomfortable. It seems to me that, in a sense, what we're doing is sharing knowledge about sharing knowledge, but we're doing it in a way that is perfectly consistent with the knowledge that's already in people's heads. Therefore, what we're actually doing is managing knowledge management, engaging someone to consider and understand what's possible, rather than simply giving them data. They're defining what knowledge management means by being examples themselves.

That doesn't negate the need for KPIs, but KPIs may not be the justification that people think they are, as much as something that brings alignment with activities and objectives. You don't get alignment from case studies. What you get is knowledge and understanding, so you need both. I agree that networks need KPIs because that's the metric everyone understands right now. For example, if we want to reduce lifting costs by 5% this year, that's the objective. And I now know whether I've got a contribution to make in that area. But just saying we've got a target to shoot for doesn't help everyone engage and collaborate about what can be done to meet the objective. Best practices and success stories are needed for that.

Rodulfo Prieto, *PDVSA:*
We have included intangibles like people's attitudes in our scorecard by developing a way to measure what we call "Attitudinal Base for Change" (ABC) and establishing metrics for 12 to 14 items related to intangibles such as how people feel about being connected and working with each other. This effort to gather information on knowledge-sharing and knowledge-teaching was started about three years ago. We submitted the data for an independent evaluation, and so far the results have been helpful and encouraging. Our knowledge-sharing results have shown improvement during the past two years. Leadership, accountability, sharing knowledge and orientation to excellence are some of the aspects that are being evaluated.

Reid Smith, *Schlumberger:*
This year, we made knowledge-sharing part of our annual performance reviews for the first time. We thought about adding it three years ago, but decided against having another headquarters initiative. We knew it would ultimately be necessary to recognize knowledge-sharing in the performance-management process, but waited until our field engineers, particularly those associated with the InTouch system, suggested it. They wanted knowledge-sharing on the appraisal form along with the other indicators that they're measured against. They defined it and wrote up the description, which made it much easier to initiate. As a result of this rollout in Oilfield Services, most Schlumberger field personnel have objectives related to best practices, lessons learned and other aspects of knowledge management.

Intellectual capital has implications related to how our companies go forward, working in pairs or in industry groups. Is intellectual capital valued inside and outside of your companies? What possibilities exist for knowledge-sharing across companies and across the industry?

Lesley Chipperfield, *Shell International E&P:*
If you go back five years or even 18 months, we didn't speak with competitors on a meaningful level. Then ironically, with the recognition that intellectual capital is tremendously valuable, we started being more open. We used to treat everything like the "crown jewels," but now, we're beginning to differentiate in terms of what we can learn through collaboration with other companies and assign value only to the truly important factors in performance. If, for example, we want to share information about implementing an accounting system, we break it down to a base level and compare experience between companies. No one is concerned about this type of knowledge interaction anymore.

John Old, *Texaco:*
Establishing metrics to justify intangible intellectual capital and knowledge assets provides internal value for a company. There's also value in starting to think of people as an opportunity to invest in intellectual capital, rather than as a cost.

Chris Mottershead, *BP:*
We need to do what you're describing, but we need to do it because we value people and want to see how we're adding value to our people. Considering the staff to be intellectual assets and investing in them is at the core of Shell's e-Learning process, which I think is a correct

Reid Smith, Schlumberger:
This year, we made knowledge-sharing part of our annual performance reviews for the first time.

approach. You end up with KPIs from the old paradigm, and you do need KPIs, but they need to respect what we're investing in. Where people are concerned, you hear proposals about measuring things like number of patents created, but this type of metric would be a spurious measure if you were actually trying to build the competence of your organization for the future. The danger is that if the stock price doesn't move, everyone stops emphasizing the value of intellectual capital. What we need to do is to continue to invest in marketing knowledge management. There needs to be an external imperative in order to get companies to innovate freely.

Lesley Chipperfield, Shell International E&P:
If you go back five years or even 18 months, we didn't speak with competitors on a meaningful level. Then ironically, with the recognition that intellectual capital is tremendously valuable, we started being more open.

Lesley Chipperfield, *Shell International E&P:*
There's an ongoing challenge in picking the right performance indicators and the right mix of development costs, production costs and other indicators that are more difficult to measure. Companies are developing training metrics and trying to measure the investments they make in people. For the first time, we have an element on our corporate scorecard that has to do with people and includes things like personal development plans as well as learning opportunities. At this stage, there are a number of considerations, but they're primarily soft, not hard, issues. We're not asking about the training budget, and we're not looking for organizational or mechanical things. Therefore, these measurements must be done through structured discussions to collect information that's fair and will actually influence overall business performance.

Jeff Stemke, *Chevron:*
We also should consider quantifying intellectual assets as motivation to move more toward managing our companies in a way that stresses the importance of people. Even though we're decentralized, there are opportunities in big companies for integrating knowledge-management processes across the enterprise, but business-unit barriers sometimes make this difficult.

John Old, *Texaco:*
Companies tend to have systems that mandate doing X or Y within a certain time frame and budget. We don't give people freedom to go out and look for innovative business approaches. When somebody does create something unique or innovative, it doesn't flow throughout the organization. Systematic knowledge management, done properly, enables knowledge to emerge and flow to the right people within an organization at the right time, so that they can act more efficiently and effectively.

Reid Smith, *Schlumberger:*
Looking ahead, I'm interested in where you think knowledge management stands today and where you think it is going (see "Knowledge Management Is …," *page 78*). What challenges and opportunities do you see for the future?

Lesley Chipperfield, *Shell International E&P:*
Of the elements mentioned, the biggest is innovation and creativity through diversity, bringing in people who aren't traditionally at the table to generate new ideas. This is something we're beginning to see, but still within the traditional links between disciplines. When you bring non-E&P people with fresh business ideas into the mix, it generates new opportunities. You see this in some of the e-Initiatives. The speed at which we roll out new technologies will continue to increase. That was one of the factors that got us into knowledge management in the first place, and it will never disappear entirely.

In terms of attracting people to the company, another factor is individual expectations. New employees come in with different expectations and ways of working. When we talk about attractive careers and what individuals expect, it is no longer enough to invite them to join Shell and see the world until they retire. Many people don't want that. They want something different. To bring in new people, we have to respond by giving them satisfying jobs and letting them develop and flourish during their careers.

The question of affiliation, or where people find their identities within a company, is also an important one. And in this new knowledge-management world, we must come to grips with that. It's less important for new hires, but the affiliation of people who've been in the company for many years tends to be with a local company and discipline. However, as people move from one asset team to another, you start to see that affiliation has more to do with the project or asset that they're on at the time.

This is a cultural shift that we have to manage. New employees seem to handle this better than those who've been around longer and feel comfortable with their established roots. New people feel freer within the organization. People need to be able to join in where their expertise is best deployed. You really start getting to the bottom line when people are working where they can uniquely add value.

Jeff Stemke, Chevron:
The key to future success is for the members of technical and process networks who understand business problems and technological solutions to make quicker connections.

Jeff Stemke, *Chevron:*
Accelerated deployment of innovative ideas is an important business driver, and technology companies need to do it more effectively. The key to future success is for the members of technical and process networks who understand business problems and technological solutions to make quicker connections. We all have great ideas, so the sooner we deploy them, the more benefits and savings we achieve. This is an area where knowledge management plays a big role. We understand mechanically how we make connections and can get that to happen, which is more of a here-and-now aspect. The future is about how to improve knowledge management through creativity and innovation. In other words, how to achieve broader coverage. Experts discover new things and turn them into products, but how can we increase the number of people who are effectively involved in that creative process?

Looking ahead, I also see knowledge management in terms of five components: people, processes, behavior, technology and content. People are going to change during the next decade as we move toward more virtual teams where people in different companies work together. But we'll probably go beyond that to have independent agents linked together for projects. These people may work for different companies or be self-employed knowledge agents. How we connect them is one challenge. There are more critical aspects that I don't have answers for. How do we manage this collection of individuals, whether they're in different companies or acting as individual agents? How do we retain the allegiances that we now have on internal projects? And how do we motivate people and achieve results when they aren't all working within the company?

John Old, *Texaco:*
The strength of knowledge management lies not only in how broad the networks are, but also in their diversity. We have a deep-rooted mechanical view of organizations that inhibits us. We talk about change, but commitments to rigid performance-management systems, expense budgets and capital-expenditure programs keep companies from changing. Although these systems are designed to ensure stability, companies are going to take a hard look at these systems. With a more organic approach, you get a clear view of a company's purpose and principles. For example, the open job market is an organic approach.

When you let people migrate to where they want to work, it is incumbent on companies and projects to be as attractive as possible so people want to work there. It's attractive for new recruits to see a place where they can potentially achieve anything they want. There's a perception that big companies are not innovative and eventually must turn to alliances with smaller companies for innovation. But in large companies, like the ones represented here, there's a lot of untapped potential because our mechanical structures put people in boxes and keep them there. In the near future, companies will recognize the power in their employees' minds and allow them more freedom to innovate.

No one is going to get out of bed in the morning and charge into work to improve the return on capital employed, but they will charge into work to deliver light, comfort and mobility to people. That's not overly prescriptive and gives people freedom to let their imagination roam, which can take companies in new and unpredicted directions. That's the type of concept that someone will latch onto in the future.

Erik Åbø, *Statoil:*
In the future, key performance indicators will still be a driving force, but reducing finding costs by decreasing risk is also important, as is reducing lifting costs. By addressing production and efficiency through proper knowledge management, we will focus on KPIs and create an environment that puts people as well as competence in perspective. Everyone should be able to use the overall knowledge of his or her company. The most difficult task will continue to be managing the volume of information. However, it shouldn't

Erik Åbø, Statoil:
By addressing production and efficiency through proper knowledge management, we will focus on key performance indicators and create an environment that puts people as well as competence in perspective.

Chris Mottershead, BP:
What we've talked about are the basic foundations and building blocks of a new world where winning companies will recognize the need for diversity and realize that they must integrate all of these knowledge-management components.

be necessary to find and access all the available data just to do your job efficiently, improve performance and contribute in key areas. Knowledge management is how we deal with that problem and make sure that people have access to the right information.

Lesley Chipperfield, *Shell International E&P:*
The idea of everyone having some stake in the KPI is extremely powerful. It starts to enable the scenarios you're painting. If you don't have a KPI, or metric, then you have potential for chaos because people are pursuing what interests them rather than what's in the company's best interest. Our networks, for example, now have a scorecard, which is effectively the KPI. They're not perfect yet, but they're evolving to truly meaningful measurements. However, this concept of a business objective that may not necessarily have a direct link with that network would be an extremely powerful way of driving the behaviors that you need and getting everyone moving toward the same goal, maybe at different speeds and from different directions.

Chris Mottershead, *BP:*
The industry is radically different from what anyone would have predicted ten years ago. In fact, our conversation about e-Learning represents an open forum that you couldn't have imagined even 12 months ago. Relationships are no longer adversarial, which seems to be a signpost for the future. However, it's unwise to extrapolate or make linear projections from this point in time.

Future communities of practice will knock down old boundaries. Companies with communities that can come together to satisfy the different needs of an organization will be successful. We don't know what 2011 will be like, but it will probably have communities of practice that are radically different and more open. What we've talked about are the basic foundations and building blocks of a new world where winning companies will recognize the need for diversity and realize that they must integrate all of these knowledge-management components. But, then how do you measure performance against clear objectives with metrics?

We've spent 10 years building an industry around key performance indicators. If lifting cost is $3 per barrel, but it needs to be $2.90 per barrel next year, that's the KPI. Therefore, much of the current knowledge-management technology gets deployed to meet KPI objectives. This will continue because it's a necessary part of delivering performance. However, companies will say, "We have all the necessary components, so we must be open, knock down firewalls and integrate knowledge management in a way that brings clarity, focus and direction, but doesn't overprescribe." We will have to continue what we're already doing inside our companies and, at times, across the industry. That will push the limits of knowledge management.

Rodulfo Prieto, *PDVSA:*
The speed at which we make adaptations is going to be very important. We mentioned faster deployment, but faster input also is going to be a key factor. How quickly we put the pieces together and adapt them into our companies will make a difference in the future. That's where I believe knowledge management is headed. I envision a world with no firewalls. Competition will not be over data, but over ways to use data faster and develop solutions more quickly.

Reid Smith, *Schlumberger:*
Some people say we have to focus on the future; we have to know what the standards will be. Others say knowledge management is changing so fast that we shouldn't try to look ahead and think about the future. Knowledge management is changing quickly, and while predictions may be wrong, it's important to project and plan ahead to be better prepared to react to whatever comes up. "Too fast to follow" is a tag line that Shell uses.

Lesley Chipperfield, *Shell International E&P:*
Yes, but we have to go beyond reacting. If knowledge management is too fast to follow, we must spot opportunities rather than react to whatever technological solution or answer has recently come along. It's important to seize knowledge-management opportunities. —MET