

Knowledge Management - A Beacon for Excellence in Exploratory Data Management

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Summary

“Add permeability to knowledge flow”

“Knowledge is sticky. Without a systematic process and enablers, it won’t flow.” - Carla O’Dell, APQC

Oil Industry has long been recognized as one of the leaders in the field of Knowledge Management (KM) with companies spending millions of dollars on promising initiatives. The business process of today’s E&P companies depends on enormous volumes of data and information. Professionals of companies expend most of their time and resources locating data and determine the quality, history and context in which data and information were acquired. When oil and gas companies have been faced with new technology, new partnership and government regulation, their KM teams have provided support through technology and knowledge transfer as well as asset management. The Society of Petroleum Engineers (SPE) estimates that between 1980 and 1998, the number of people working in the oil and gas industry fell from 700,000 to 300,000 people, by 2010, industry will lose 231,000 years of cumulative experience and knowledge due to retirement. Hence capture of their knowledge and specialization is important before it goes out of door. The oil and gas industry is experiencing upheaval as unprecedented numbers of experienced employees reach retirement. E&P companies are aware of the urgent need to capture knowledge within their organizations. Carla O’Dell’s observation led to think about similarities and differences between knowledge flow in the human world and fluid flow in the geological world. Improving operational performance requires the understanding and flexibility to combine proven methodology, technologies, and domain expertise in the creation of KM solutions that are ideal for exploration business as well as technical professional for taking right decisions for hydrocarbon hunting. Implementing successful knowledge management in oil exploration requires a systematic change approach by taking advantage of an established infrastructure and more knowledgeable workforce pursuing continuous improvement.. Proper implementation of KM will ensure reduced costs of exploration activities and increased efficiency every step of the way.

Introduction

The Oil and gas companies are taking aggressive role in data management at a time when such data - specially, seismic information, historical well and log information continues to amass within companies’ data warehouses. The development of a prudent and efficient data management strategy remains one of the industry’s most daunting challenges. Most companies are quite concerned that they either are not utilizing all the knowledge that exists within their organization or that within next 5-10 years; they will lose a great deal of it as their key people retire. Effective data management plays a vital role for most of the big companies for merger, acquisitions by exploration bidding blocks, overseas acquisitions. To stay competitive, organization tries to effectively exploit its resources. But chances are that company’s intellectual assets are seriously under-utilized, which means costs are higher than necessary, productively is lower and competitive edge isn’t as sharp as it should be.

“A company that is not managing knowledge is not paying attention to business,” Thomas Stewart, author of *Intellectual Capital*, in his keynote presentation at TRAINING 2000.

Chevron (now Chevron Texaco’s) defines Knowledge Management as “Processes, tools, and behaviors that deliver the right content to the right people at the right time, and in the right context so they can make the best decisions, exploit business opportunities, and promote innovative ideas so that exploration based decisions can be taken for excellent hydrocarbon prospects. Professionals in the oil industry feel that for success of the company, one must become expert in capturing knowledge, integrating and preserving it, and then making what has been learned quickly and easily available to anyone who will be involved in the next business decision. The exploration of a potential oil and gas field yields lots of data, which is subject to analysis and evaluation. Geological “analogs” refer to the clues accumulated in the field development; and scientists and



engineers constantly use that for comparison with the information they already have. The more relevant clues they have, the better their judgment will be on exploration. Global demand on oil and gas are rising, commodity prices are at historic highs, and interest rates are at record low. But oil and gas companies looking ahead to the future, those that know how to make the most of today's prosperity can extend its impact for decades to come. In the oil and gas industry, most of us share fundamental belief that it takes an average of seven years for new E&P workers to achieve a level of competence that permits them to make or recommend appropriate risk decision – not just decision, but decisions that comprehend all of the actual exploration risks and costs involved. Knowledge or “experience” is not equal to “years of work” in any industry or field of endeavor. Some people who have “been in the business” for 25 years have gained one year of experience and just repeated it 25 times.

Successful implementation of KM in oil & Gas Company

“Knowledge management is a *practice*— *striving to become a science*”

The foremost requirement for enabling KM successfully is technologies after knowledge know-how. KM is a multi disciplinary field involving diverse aspects such as information technology, interpersonal communication, organizational learning, cognitive science, motivation, and training and business process analysis. Every oil and gas company has a unique collection of knowledge assets and distinct scope of area and issues, to which those assets must be applied. Proper planning is required to implement KM in line with the core exploration and production. The three basic components of KM i.e. experts knowledge base, intelligent algorithms and real time availability of which, the first one requires data management concepts and the last two are fully dependent on information technology .

Planning KM implementation has focus on three thrust areas.

1. Technology – to enable human's efforts on KM activities.
 2. Organizational dynamics – to overcome barriers to sharing knowledge.
 3. Application- KM must align with the core business activities like exploration.
- Find an opportunity to apply KM principles and practices in a small pilot like Neelam or Heera two

producing asset in Mumbai-High show that benefit and support will soon follow for building a reputation; respect for your efforts will follow the ability to improve the existing environment.

- Show the return on investment in quantitative or qualitative terms in areas of increased productivity, increased capacity, and time savings.
- Develop people, process, and content components first and then select a technology to enable them .
- Many vendors claim to have a best KM solution for exploration to mitigate the risk. But as the best and experience explorationist. the solution may be find that no one technology or tool will work for risky exploration environment. Many tools/technology may have to be integrated into back-end architecture to meet all the requirements.
- Run a side by side comparison of each tool/technology weighing the risk, benefits, pros & cons in the areas of functionality provided to meet present exploration requirements; evaluation is done in long-term relationship/costs with supplier. Do they insist on their knowledge engineers be used any time new functionality or changes need to be made or knowledge provided? Does it make more sense to develop a knowledge management environment of knowledge managers, explorationist, etc. within E & P Company?
- Technology is changing all the time; be sure knowledge infrastructure can adjust; plug and unplug technologies without breaking people, process and content component.

The use of effective knowledge management in core business i.e. exploration enables an organization to start on the path to becoming a learning organization on that particular business. Effective knowledge once started on acquisition edge propagates rapidly throughout the organization to other activities i.e. processing and interpretation

Communities of expertise in exploration areas

One of the most successful methods of sharing knowledge on exploration areas in the oil industry is setting up knowledge communities within the Geo-field parties, processing and interpretation. The size, shape, human touch and permanence of these communities can vary enormously.



Fig :1 Seismic section on papers Courtesy: LGC.

a question has already been asked then the software retrieves the answer. If the question (or a similar one) hasn't been asked or if the retrieved response doesn't satisfy the user, then Organik can escalate the question to a human expert to answer, thus facilitating the extraction of tacit knowledge from the expert.

The exploration in oil & gas industry is experiencing a high churn in human capital at the moment, not least because of its ageing demographics with high exploration risk and competition. As companies lose staff so they lose the information they hold,” says Stephen Cross of Convera. Using tools such as Organik to extract tacit knowledge can help stem this loss of information.

Atofina, the petrochemical branch of merged Total, Fina and Elf, has deployed a bilingual version of Organik across its US and European research and development departments. It operates simultaneously in English and French, allowing users to find people and expertise and ask questions in either language, surpassing linguistic and cultural differences normally experienced when employees operate from disparate locations. The first phase of this deployment is currently rolling out in France, Belgium and the US to 650 employees. The rollout to a much larger user base will under progress.

Geophysicists at Murphy Oil Co. Ltd. review large-scale stereoscopic visualizations using the Fakespace Systems Inc.'s WorkWall, which enables better understanding and quick analysis of seismic data. “In many of our active offshore exploration projects, we are dealing with extremely large amounts of volumetric data,” said Duncan McMaster, general manager, East Coast exploration, with Murphy Oil. “The new visualization center improves our ability to understand these huge data sets and speeds our ability to make effective drilling decisions.”

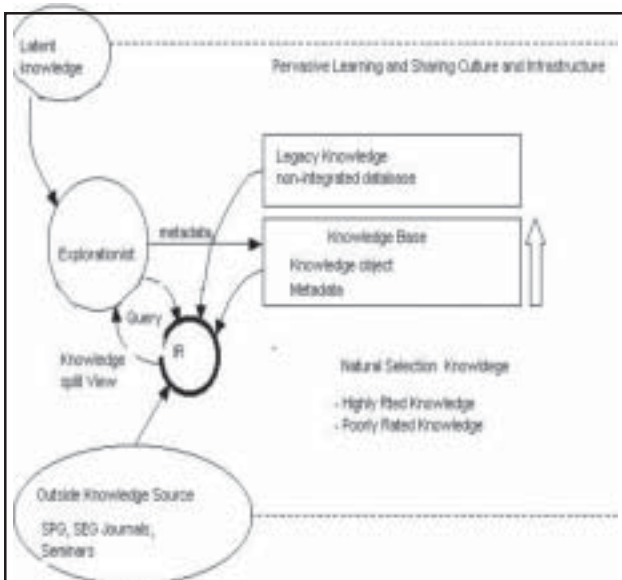


Fig. 2: Knowledge management architecture vision.

At one end of the spectrum, geoscientists embarking on a new area will invite peers to volunteer their experiences on similar areas. At the other end, under Head Geophysical Services (HGS) have to set up online knowledge communities either individually or collectively to provide a means and a location for the extraction and sharing of tacit knowledge.

One such community is the Common Knowledge site created by Vardus to serve the oil industry. The site uses Organik, Orbital's knowledge sharing software. Organik allows users to ask questions of the community database. If

Workflow

E &P companies also build up their knowledge of their operations by creating 'Exploration files'. All information on operational events, each day's activities, is captured on operational reports that go into the Exploration file. The companies analyse these reports to improve acquisition, processing and interpretation processes, reduce costs, and improving the quality at each stages, reduce the risk of hazardous events during an acquisition . However, since this documentation is exceptionally data intensive, analysing these files is extremely time consuming and can



hamper oil companies making the right decisions. GEOPLAY has developed an electronic version of the exploration file where geoscientists can enter information into templates that can then be saved into a virtual exploration file.

Data mining

The next logical step in applying KM techniques is to put all the information gathered so far, information from procurement, operational data and financial data, into a repository. Once there, it can be used to produce operation reports on a daily basis, or be used to help calculate costs and parameters for other similar field areas. “The more data you accumulate, the more data you can do analytics on, the more value that you can build into the system. So the system actually gains value with time,”

Geoplay is a specific subset of XML that allows companies to transfer information without having to reformat the data for use by other computers. By using GEOXML tag sets, service providers and operators can instantly and correctly interpret and use each other’s data without spending long hours duplicating data entry.

“GEOXML allows combining the financial data, the procurement data and the operational data into a repository, or repository metadata, that allows us to do analytics on the data.”

Case study: Schlumberger knowledge hub

Schlumberger Information Solutions is an operating unit of Schlumberger. SIS provides consulting, software, information management and IT infrastructure services to support the core operational processes of the oil and gas industry. **The InTouch Knowledge Hub provides** a single electronic interface for information exchange on products and services between the field (Schlumberger engineers located at customers’ locations) and its technology centers (help desks that handle incoming calls and questions from the field organization). Through the InTouch application, the field has easy user-friendly interchange capabilities with these technology experts and access to validated information, electronic documentation, knowledge repositories, and training aids.

SIS enables oil and gas companies to drive their business performance and realize the potential of the digital oilfield. Schlumberger Oilfield Services is the world’s leading oilfield services company supplying a wide range of products

and services from formation evaluation through directional drilling, well cementing and stimulation, well completions and productivity. Today, Schlumberger employs more than 45,000 people of over 140 nationalities working in 100 countries. The company also manages WesternGeco, jointly owned with BakerHughes, which is the world’s largest seismic company and provides advanced acquisition and data processing services. In 2003, Schlumberger operating revenue was \$11.4 billion.

Situation analysis

Oilfield techniques and technology change rapidly as the industry continues to innovate in well construction. To keep pace with these advances, training and best practices management must take a new direction, so personnel are able to take advantage of new measurements and techniques in real time to improve efficiency and reduce operational risk. Prior to 1999, the Schlumberger oilfield services organization operated largely as a series of semi-autonomous, regional organizations operating in over 100 locations across the world, with training and technology support provided from the operational center in Houston. Procedures and technology were standardized across the world, but communication between different operating regions could sometimes be slow. Sharing experiences about working in the most challenging operating conditions needed to progress in order to increase drilling efficiency. In such a demanding and dynamic environment, it was imperative that Schlumberger improve its knowledge management (KM) – the ability to capture, share and apply expertise worldwide – if it was going to continue to consistently supply the best solutions and practices.

Schlumberger solution

In 1999, Schlumberger started a KM pilot to build a knowledge hub for oilfield personnel, primarily to improve the ability of its people to provide the best quality service. Technologically, the challenge was manageable; the Schlumberger global intranet SINet* already provided secure, authenticated connectivity between most of the company’s sites and offices, and the Schlumberger corporate knowledge hub offered a software tool to publish and easily disseminate information. Although the ability to use in one part of the world what we have learned in another is helped by tools and technology, people are both the key to successful KM and its most challenging element. Success depends on motivating people to share their knowledge and reuse that of others as part of the day-to-day job.

On the other KM related Portal called Schlumberger **Realtime News** is a news-based corporate portal, hosted on the Hub, which is updated every hour with the most current industry and corporate news. Customers and employees can search, categorize, and customize the information. Real time news allows Schlumberger employees to be in close touch with their customers in real time; the goal is also to align the perspective of the employees with that of their customers. More importantly, customers might return to the Schlumberger home page for more information. The same way ONGC developing the knowledge portal for their E &P operations, which help the geo-scientists other drilling production engineers to take decision at right time with respect to knowledge available without waiting time. Thus will save the millions of dollar for Geo-scientist for their activities.

Example initiatives and case studies

Many E&P companies have set up communities with the philosophy that 'extracting the knowledge from people is not the answer, keeping them linked is'. **Geosciences** disciplines particularly, due to their highly interpretative and therefore subjective nature, are ideal candidates for these communities. It seems that communities are natural and exist informally as well as formally within an organization. They appear to be an excellent way to learn and share knowledge with other people who have a common interest.

Discussion databases allow the 'posting' of questions and information under certain topics that are made



Fig. 3 Interpretation at VR centre Courtesy: LGC.

available throughout the company. This technology decreases the costs of e-mail, addresses the full community rather than a subset and maintains a record of all information passed and therefore acts as another 'knowledge base'.

- British Gas Technology has integrated its various information sources to establish a live 'Technology Knowledge Bank' to connect people to explicit knowledge and information. By using a sophisticated search engine, both internal and external information sources can be interrogated by full text intelligent searching on the company's intranet.
- Texaco E&P have used specific assessment methodology to understand the culture of their organisation. The same methodology was used to establish an 'ideal culture' for effective knowledge exchange. This identified areas where changing the culture could improve knowledge exchange within their organization
- Shell E&P have created the role of an 'energising moderator' for their communities. Shell sees this person as an ambassador for the community, continually marketing the concepts and benefits as well as chasing up people and maintaining the momentum of the community. Shell has found that only 20% of the value of KM originated from information/lessons learnt. However, 80% of the value of KM is generated by posting a need for information that is subsequently satisfied by someone - providing that information or referring to someone else who could provide that information. The moral of the story is that while creating knowledge databases is useful, they can only ever capture a fraction of the knowledge held by a community.
- BP Amoco has implemented such a system with over 10,000 employee pages. Their approach has been to encourage rather than dictate to the users. They believe individual empowerment is the key and found that a photograph on an individual's home page is invaluable.
- Mobile has developed a dynamic basin modeling tool (Sextant) to assist their explorationist for better decision.
- Marathon Oil Co. used PointCross Inc.'s Orchestra relational knowledge management system for a portion of the Canyon Express deepwater gas pipeline project



in the Gulf of Mexico to improve its capital efficiencies by reducing the time it takes to move new technology.

Conclusions

The objective of KM in exploration specific areas in E & P companies are to support the achievement of business-objectives. Knowledge-contributions / sharing as well as re-use need to be encouraged and recognized at the individual geophysical level as well as the chief geophysical services level. This is best done by measuring and rewarding knowledge-performance. At Schlumberger, the InTouch system created a centralized knowledge-based organization, with easy access to information. The results were \$150 million cost savings a year, a 95 percent reduction in time to resolve technical queries, and a 75 percent reduction in time to update engineering modifications.

Many companies are still struggling to quantify benefits that can be displayed on the balance sheet, although some like BP Amoco, Shell and Chevron have shown some quantified benefits. More natural everyday processes will probably succeed the pilot initiatives with an emphasis on how knowledge can be re-used for idea generation.

Finally, three approaches that may be employed in an effort to minimize the risk involved in exploration process in undertaking a knowledge management program and concurrently enhance the probability of a successful implementation in each stage of exploration in oil and gas industry. These three approaches were: to ensure that the initial KM effort is targeted at an appropriate area in each stage of exploration phase that will have a quick success and highlight the positive aspects of the program, that the use of an options based approach for determining investment decisions may be applicable to knowledge efforts as well, and that initiatives aimed at second-generation KM programs are more likely to prove beneficial in the long term. Following these guidelines and recommendations should result in the successful justification of the business case for a knowledge program as well as providing an organization with valuable insights into how to make their initiative a resounding success.

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