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Real-Time Collaboration—Efficient Problem Solving and Extending Resources

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Abstract

To meet the challenges to the industry of increasing hydrocarbon demand, increasing well complexity, reduced employee experience levels and the large physical distances between operational centers, advances in digital technologies are being increasingly leveraged by both operator initiatives and service company initiatives such as Halliburton's Digital Asset. Terms such as “smart wells” and “real time” have become more commonplace. Data is being generated faster than ever. The ability to interpret this data, model the data and implement optimized solutions in real time is critical to operational success. The demands placed on operating in a cost efficient manner, with greater returns on investment are ever present.

The use of a Knowledge Management collaboration tool, a key component of the Digital Asset, helps to meet these challenges by providing a real time collaborative environment which spans global operations, supports and develops synergies between multiple disciplines and transcends geographical and language barriers. Through its use an intentional shift in focus has taken place from centrally located sources of expertise to virtual ones. Virtual centers of collaboration empower users to collaborate, problem solve and share knowledge on demand. Any user, i.e. employee, can rapidly access the global expertise needed to put well challenges, potential solutions and increasing volumes of data and information in appropriate context. Through access to these extended resources employees can solve problems more efficiently and offer better solutions. Technical experts can cover more ground. Collaboration is facilitated by dedicated personnel who maintain a vital link with local, regional, and global technology leaders.

Examples from Canada, where the use of this approach contributed to an HTHP well being saved, along with an estimated cost of $15 million, from China where urgent advice was delivered to a rig experiencing an underground blowout and from Brazil where global experts collaboratively contributed to solving a wellbore stability problem will demonstrate how real time collaborative solutions are developed and moved from the virtual to real world environment to improve operational service delivery to external clients in the global market place. Lessons learned, best practices and strategies employed to engage users in the use of this collaborative environment are outlined.

Introduction and Context

Today in the oil and gas industry we face several challenges. Demand is increasing, but hydrocarbons are harder to find, reservoirs are smaller, and they are located in more difficult environments. At the same time, our pool of skilled and experienced knowledge workers is shrinking and being replaced with a pool of significantly less experienced personnel.

In the future these issues are likely to become exacerbated. Reserves will become even harder to find and wells more difficult to drill and produce. The industry’s challenge of recruiting, developing and retaining a global workforce is well documented[1, 2, 3, 4, 5, 6 7]and frequently discussed. Significant portions of the industry population are approaching retirement age and either an insufficient inflow of younger professionals are available or there is limited time to develop younger workers to fill the void left by outgoing personnel. These eventual retirees frequently are the most experienced, knowledgeable employees in the organization.

Over the past 25 years the demands for cost effective operations have led the industry to relentlessly digitize virtually every aspect of exploration and production. Data management, networking and infrastructure now provide digital connectivity worldwide. Operators and service companies alike are seeking to leverage these technological advances to improve their

ability to measure, analyze and optimize the cost effective extraction of oil and gas through the deployment of various initiatives which combine aspects such as enhanced real-time data availability, remote, smart or self-learning technologies and the enhanced ability for people to make decisions and collaborate around real-time information.

Our ability to meet current and future challenges does not depend solely on our ability to make advances in technologies which measure, transmit or analyze data. The importance of people and process in the digital oil field has been widely acknowledged [8, 9, 10, 11]. Given the global industry workforce challenges and the increasing flow of data available to employees, it is critical that employees have the means to work collaboratively, to share and draw on all available expertise and experience to enable appropriate decision making.

This paper will highlight how the ability to collaborate in real-time using a Knowledge Management (KM) collaboration tool can extend the resources that can be brought to bear in providing solutions to real-time well issues and how this type of collaboration can help to meet these challenges to our industry.

Through use of a global real-time collaboration tool an employee anywhere in the world can instantaneously initiate cross discipline collaboration to solve problems or encourage innovation. All members of the global community can instanteously view and reply to discussions from all communities. The global distribution of the company's expertise means that there are experts able to respond to problems 24 hours a day.

A key feature of this tool is that collaboration can be shared among any or all technical communities and support groups, facilitating a sharply improved understanding of the relationships among various oilfield disciplines. Where synergies exist, or can be created the provision of integrated solutions is enabled.

Use of the collaboration tool thus extends the resources available to an individual employee, empowering them with access to the experience and knowledge they need to be able to put the challenges they are facing, and data they hold, in context, to work smarter and to make better decisions. By bringing the right people together with the right data, problem solving and decision making can be accelerated and the right solution can be provided at the right time.

Definitions

The Digital Asset™

Halliburton defines the Digital Asset™ as a real-time collaborative environment to model, measure and optimize operators' assets. It connects people, technology and processes in a collaborative environment for better, more efficient decision-making.

The Digital Asset is not a product but an environment that can be realized through a customized, consultative approach that addresses operators' most important business needs with improved efficiency. Benefits include the ability to:

- Exploit more difficult reserves while lowering costs.
- Increase profits while reducing risk.
- Increase accuracy while reducing time.
- Speed up work processes while cutting non-productive time (NPT).

The Digital Asset brings together all the elements that make this possible. Built on a foundation of digital infrastructure are a number of enabling applications, tools and technologies. Integration of these disparate technologies within the industry – regardless of whether the technologies belong to operators, third parties or Halliburton is key to the Digital Asset. Integrated, cross disciplinary workflows using these technologies can help to overcome the issues facing the industry by enabling assets to be modeled, measured and optimized in real-time and with improved efficiency.

Some components of the Digital Asset that are creating value today include:

- Multi-disciplinary Real Time Centers™ – more than two dozen such physical centers have been created globally allowing multiple jobs to be managed from a central location. Real time data from prospect generation, drilling, logging, field delineation, reservoir modeling and production enhancement can be integrated and collaborated upon by knowledgeable experts.
- A software environment that enables cross-disciplinary connectivity among many types of databases and applications resulting in increased accuracy of data communication and sharing in reduced time.
- Technologies which collect and process real time data during operations e.g. to model fracturing progress during frac jobs, to continuously update and refine earth models as drilling progresses, to calculate optimal production settings using sophisticated self-learning models, to monitor and predict hole cleaning and well hydraulics and to visualize cement and spacer positioning during cement jobs.

- Efficient problem solving through the use of a global real time collaboration tool – part of the companies Knowledge Management effort - is another key workflow in the Digital Asset and is the focus of this paper.
- Several other technologies that already exist or are in development.

Knowledge Management

There are many definitions for knowledge management. Halliburton prefers "a systematic approach to getting the right information to the right person at the right time." This is an adaptation of the American Productivity & Quality Center's (APQC) definition[12]: "A set of strategies and approaches to create, safeguard and use knowledge assets (including people and information), which allows knowledge to flow to the right people at the right time so they can apply these assets to create more value for the enterprise."

The company's KM approach is centered on developing and supporting communities of practice that meet the needs of the organization[13]. While providing access to common portal processes and tools, it is believed each community has unique needs and distinct business objectives. However, for the purposes of this discussion, the precise definition of KM adopted by a company is not critical. What matters most is the level and type of collaboration among employees that a KM system enables.

At the heart of these communities is the ability to communicate and collaborate around relevant topics. The KM tools enable anyone in the organization to:

- Ask a question
- Push knowledge (best practice, idea, etc.) proactively to the community
- See the original question/issue and all replies in one place
- Reply with an answer or opinion
- Learn on demand by searching previous discussions
- Access managed technical content and pertinent intranet/internet links

Some key functional and organisation aspects of the collaboration tool that enable knowledge sharing are:

- Collaboration communities are typically open to all employees
- Discussions are categorized by each community
- Discussion categories can be shared by communities
- Individual discussions can be shared instantaneously among the communities
- Discussions are searchable by text, category, time, author etc.

Dedicated knowledge brokers for each community provide full time administration to facilitate that community's KM effort. The knowledge brokers' primary responsibility is to oversee the collaborative discussions. Essentially, they ensure questions receive answers, issues are resolved, and stakeholders are made aware of developing challenges, solutions and opportunities.

This paper focuses on the experience and practices of the Baroid Fluid Services product service line (a community devoted to a specific Halliburton product service line).

Beyond traditional real-time collaboration

The meaning of "real-time" depends on the context in which it is used. Used in the context of data transfer or control systems real-time often means instantaneous. When discussing collaboration in this paper we consider that the collaboration tool enables real time collaboration in this instantaneous sense. Any response from any employee is visible to all employees globally virtually instantaneously - only limited by the speed of the internet etc. The development of a solution which draws on the expertise of several employees in remote locations will not occur in real-time in the same instantaneous sense. Thinking time and the time to compose a considered response prevent this. The critical benefit of use of the collaboration tool is that it enables real-time problems relating to customers wells to be solved in time, with increased efficiency and by drawing on the extended resources of the global community.

Collaboration in real time typically refers to a scenario where employees working towards a common goal or objective and collaborate either in person, using telephone, electronic mail, through a messenger application or by some other means that allows rapid or instant communication. However, these scenarios are limited in that the collaboration is limited to the predetermined team given access to the data via email, messenger or teleconference.

A physical location such as a real time operations center can be utilized to function as a focal point for data and communication streams pertinent to the topic. While there are many benefits to the real-time solution development and problem solving that occurs in this scenario it can be rather inwardly focused and limited. Analysis of the data and knowledge

collected and decisions made based on this information are often dependant on a select few employees. Furthermore, dissemination of information back into an organization can be limited and potentially key learnings not realized.

Real-time collaboration using the KM collaboration tool discussed in this paper moves beyond a number of the limitations of traditional real-time collaboration at a fixed physical location and is considered a complimentary approach to extend the knowledge and experience that can be applied to problem solving. Through KM collaboration users located in Halliburton Real Time Centers are better connected to the wider organization enabling them to both draw on a broader base of expertise to enhance problem solving as required and to share key learnings more effectively. The KM collaboration tool creates *virtual centers of collaboration* independent of geographic, and language barriers, using its intra/internet based portal system.

Any user can access the collaborative environment from any internet connection globally and so can have immediate access to collaborate, problem solve, and share knowledge on demand. Web servers house the collaboration tool application, which can be accessed using various secure connection options giving all employees the flexibility to connect to the tool while office based or mobile. Connection options are not limited to company computers loaded with IT common operating environment configurations. Any user can collaborate using an internet connected PC or mobile device with standard internet browser software. The number of collaborators has no practical limitations.

This open access and unrestricted ability to contribute has resulted in solutions that are derived more efficiently from a wide range of user levels and job roles. All of the knowledge that needs to be applied to provide an optimum solution does not necessarily reside with the employee currently performing a particular function. Employees in engineering, laboratory, management, and business development roles all typically participate in collaboration based on their accumulated knowledge and regardless of current position.

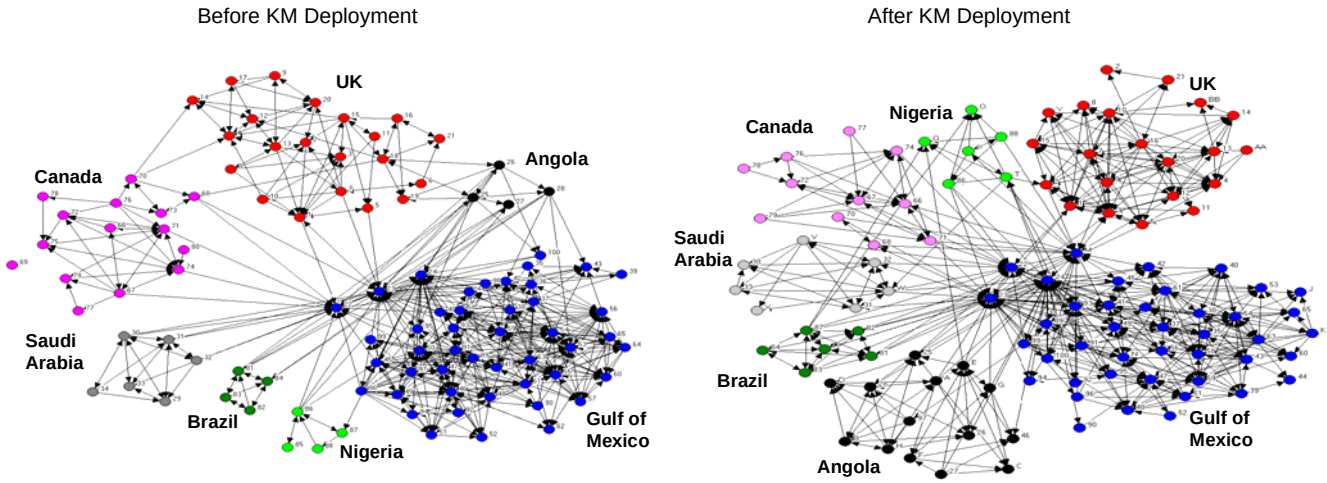
Collaborative solution development is facilitated by dedicated Knowledge Brokers for each community. Knowledge Brokers drive the collaboration topics and ensure that each is viewed by all appropriate resources. Many collaborative discussions relate to well planning issues or other non-time critical issues. Where collaboration is required on a real-time operational issue the Knowledge Brokers will prioritize this issue and ensure that all key resources are engaged. The Knowledge Brokers maintain lists or databases of key experts within the organization to enable rapid engagement of these key personnel. Local Knowledge Champions are identified in each district or country globally. These individuals act as a focal point in each location and provide a local understanding of who knows what in that location. When a collaboration relating to a live well issue occurs these resources are drawn upon to help ensure that relevant expertise residing in employees in their location is shared.

Community members will often refer items to other users where they believe other users have the skills and knowledge to contribute to solution development. This may be accomplished by using the email function of the collaboration tool, by telephone or by some other means. In addition to being able to view responses directly on the collaboration tool in real-time, employees can subscribe to particular collaborations so that they are automatically updated by email when further contributions are made. Any employee can also subscribe to be notified by email when a new collaboration on a particular topic is initiated.

Through use of the real-time collaboration tool, the participation of a 24/7 global community of experts and the facilitation of collaboration by the knowledge brokers and local knowledge champions, a true real-time global collaborative environment is created that can impact solutions to real time issues.

One way to measure the nature of this collaborative environment is to conduct a Social Network Analysis. One such study was conducted and previously reported[13]. This analysis was performed both before and after the development of a KM community, its purpose was to understand and illustrate how the KM system has reduced the isolation in which some regions existed and how it has improved global communication and collaboration within the organisation. The results of this study are shown in Figure 1 below and illustrate the way in which knowledge was shared in that particular technology line before and after KM deployment. The nodes represent individual employees and the lines represent a knowledge sharing connection between two individual employees. The arrows point to the knowledge providers.

Figure 1 Social Network Analysis



The number of people between the person in need of knowledge and the person who can provide that knowledge can be described as the "Degree of Separation." An analysis of the degrees of separation found that after KM deployment there was a 25% improvement in this figure. This statistic does not tell the full story and can be considered the "tip of the iceberg." The connections represented by the lines in these diagrams only represent the situation where an individual gets support from another individual frequently. Because of the size of the communities available to provide solutions to any one individual (many thousands), much of the knowledge sharing between any two particular individuals will be less frequent and so not readily represented on this type of diagram. It is expected that this degree of separation will further decrease as the KM community develops and matures.

A direct result of this improved communication network is not only the improved ability to share best practices more effectively globally in the medium to long term but also the ability to extend the resources that can be brought to bear in resolving real-time well issues.

Extending resources across the organization

Maximization of existing resources delivers better value to clients and investors. Real time collaboration allows employees to work more efficiently with existing resources. Given the current and future challenges to our industry, identified technical experts and thought leaders are a valued asset in deriving solutions. Many of the most frequent contributors to collaborative solution development are among the most experienced employees in the organization. The average experience with their current employer of the top 15 contributors in the Baroid Fluid Services community for 2006 was greater than 17 years. This does not include experience with previous employers. The real-time collaborative environment allows these resources to impact an extended range of operations, spreads the benefit of their accumulated experiences and enables them to more efficiently support deployed resources.

As the search for hydrocarbons continues to move to more and more remote and harsh locations, the traditional service model has been to relocate key technical resources as close as possible to the operation. However many of the more experienced personnel do not wish to locate to these types of locations. The KM collaboration tool offers a solution that allows the expertise and experience within the company to be effectively extended to cover even the most remote locations and operations, a high speed internet connection being all that is required to access that resource.

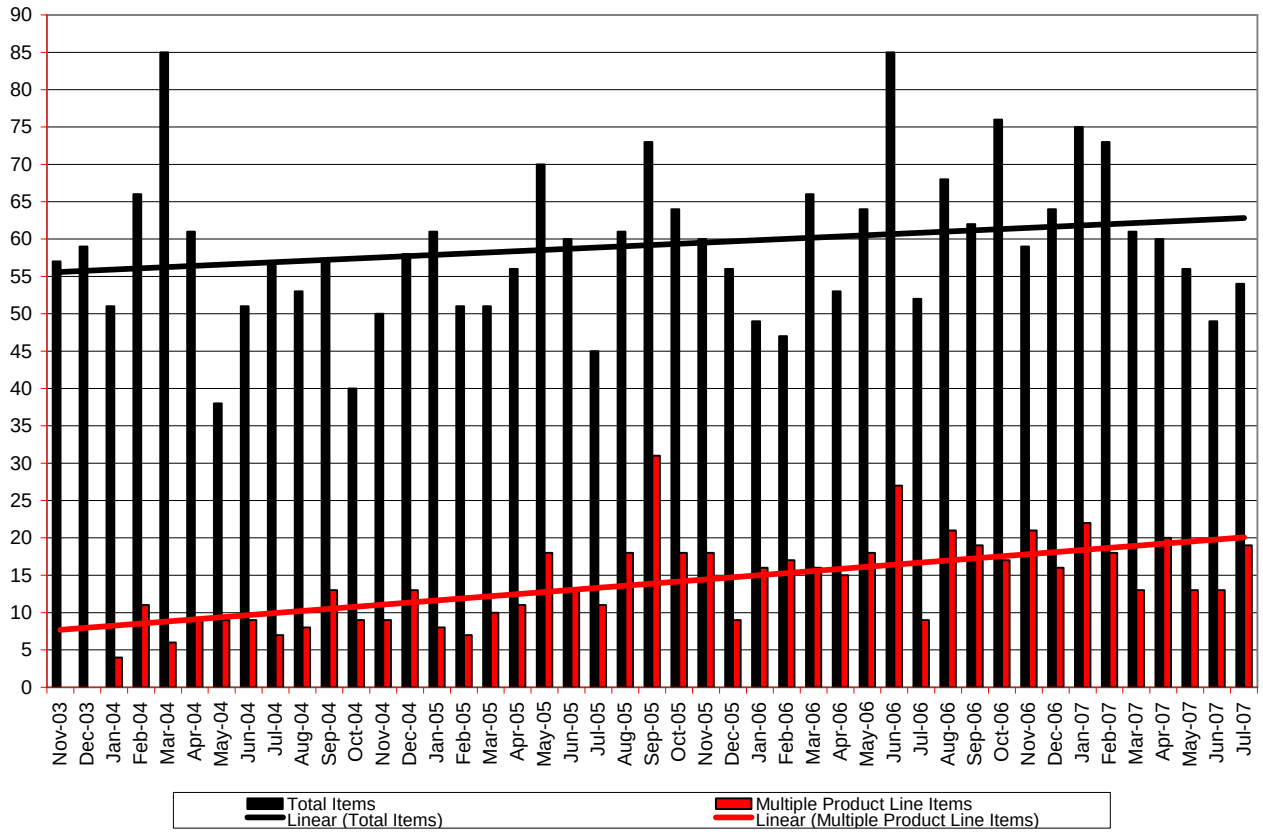
Solutions to complex well problems can require input from experts with varied technical backgrounds, in some cases from different product lines or departments within an organization. Collaboration in real time using the KM collaboration tool is dynamic and can grow beyond the initial collaboration community. Connectivity can be established between the communities of any or all product lines or support groups, leveraging or creating synergies and sharing information to meet the specific needs of the challenge faced. The collaboration enabled between the multiple communities involved is seamless. All responses are visible to all members of all communities. Thus, the technical experts that can deliver valuable input to real-time solution development can potentially reside within the community of product line.

Any employee can instantly initiate a collaboration shared between the communities of multiple product lines or support groups by selecting an appropriate collaboration "topic". Additionally, Knowledge Brokers monitor the collaborations for potential cross community sharing and maintain an active line of communication with the Knowledge Brokers of other communities. When an item appears to have benefit for another community it is made available to a target community for sharing. Once accepted by the recipient broker it is immediately visible in the target community. All existing collaborative

contributions are visible to all communities and any subsequent contributions are visible to members of all communities. The process of collaboration across communities provides diverse solutions that take into account multiple perspectives. Through the ability to share collaborations across all relevant parts of the organization the resources that can be brought to bear in solving real-time well issues can be extended as is required.

Figure 2 shows the total number of collaborations which took place each month in the Baroid Fluid Services community and the total number of collaborations that were shared between the Baroid Fluid Services community and another community. Both of these show slight upward trends over the lifetime of the community. The proportion of collaborations between multiple communities has increased slightly over the period from an average of 16% in 2004 to an average of 28% in 2006 and 2007.

Figure 2. Proportion of collaborations per month shared across multiple product lines



Employees not only gain technical insights from participation in, or observation of, collaborations, they also gain insight as to who has knowledge on particular subject area and can develop mutual support networks. The access that any individual employee has to technical expertise when faced with a real-time operational issue is extended directly through real-time collaboration but also over time they will extend the operational, personal and strategic networks that they can draw upon directly to help them solve well issues[14].

All collaborative discussions are saved and are searchable. A search can be performed by keyword, topic, or subject heading. This functionality of the collaboration tool allows users to locate existing solutions prior to initiation of any new collaboration. The collaboration tool database now has several years' worth of previously solved problems which are stored and searchable. By performing a search an employee may find an immediate and comprehensive answer to a challenge faced by their operation, or they may receive a partial solution or a better understanding of the pertinent issues - enabling them to frame a subsequent query using the collaboration tool more effectively. The search capability of the collaboration tool helps technical experts to work more effectively by reducing the need for them to address the same questions repeatedly.

The collaborative environment also helps to transcend barriers to collaboration caused by language differences. At this time, the primary language of the portal is English. However, all employees are encouraged to initiate collaborations in their native language if they are not comfortable in the use of English. Those users of KM who are bilingual assist with needed

translations. Where internal resources are not available external language resources are tapped. Materials are translated and posted back to support the ongoing collaboration.

Examples of Real Time Problem Solving

On a daily basis, the global community is collaborating in real time to solve operational issues. Collaboration can bring users from different disciplines together to evaluate the problem at hand and collaboratively develop solutions. In some cases, new solutions can be derived from a combination of pre-existing products and services.

Wellbore Breathing on an HTHP Well
An operator in Canada experienced a wellbore breathing and lost circulation problem while drilling the production interval of an HPHT well. Traditional lost circulation treatments failed and the operator was prepared to abandon the well. Using the collaboration tool, drilling fluids and cementing personnel contributed to the development of a new solution which combined existing products and processes. Eight responses were received from members of the global community within approximately three hours of the collaboration being initiated. The solution developed was successfully applied in the well within twenty seven hours of the question being posted. The entire cost of the well and associated abandonment was saved – estimated by the operator to be a cost in the region of $15 million. The customer adopted the new solution as a standard operating procedure.

Use of the collaboration tool enabled the operations team in Canada to draw on the experiences of expert employees in a range of remote locations to develop a solution in response to a critical well problem in time to address the problem. The experts who collaborated to develop this new customized solution included technical managers, lost circulation materials product managers, operations and laboratory personnel. From the data available, not including experiences with previous employers, the experts who contributed to the collaborative solution had an average experience of sixteen years.

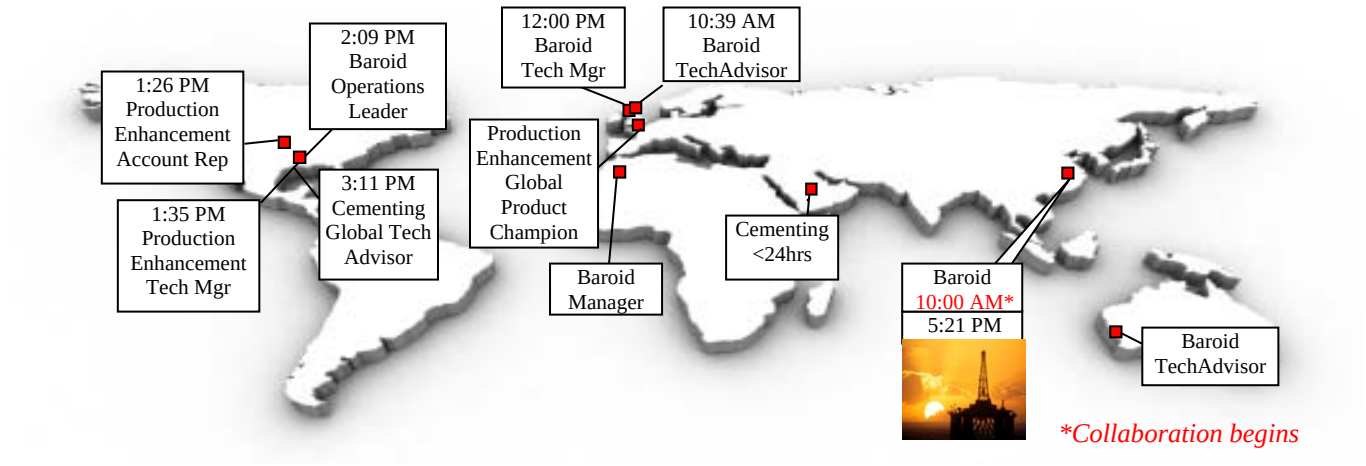
Underground Blowout in China
The ability to pose a question to the appropriate audience at the right time can be critical to collaboration successes. When initiating collaboration a user chooses from a predetermined topic listing. This user defined topic selection drives the collaboration immediately to the one or two communities that the user expects will be able to deliver valuable feedback and helps generate rapid responses from the most relevant sources.

An underground blowout occurred on a well being serviced by Halliburton's drilling fluids product line in China. Urgent advice was required to cure the losses and regain control of the well. In order to ensure that the optimum solution was provided to the operator the Baroid Fluid Services team on location used the global collaboration tool to share all available well information and data relating to the problem and to request details on previous relevant experiences in other locations or alternative approaches to solving the problem. Through selection of a shared topic the discussion was shared instantly between the collaboration tools of the drilling fluid services and cementing communities by the team on location. The Baroid community Knowledge Brokers shared the collaboration with additional communities to ensure that the issue gained maximum visibility to all potential experts who could contribute to a solution.

A total of fourteen responses were shared through the collaboration. Seven responses were shared within the first five hours of collaboration. Responses were shared by experts from multiple product lines across the organization. Collaborative contributions included requests for additional data, technical recommendations for products and processes to be used, references to published papers[15] outlining previous successes in solving these types of issues and additional context specific feedback from some of the global experts who authored these papers. The team on location was able to engage in a real-time two way collaboration with global experts and respond to requests for further information and provide updated well data. The drilling fluids and cementing communities offered product and process solutions. All solutions were evaluated and submitted to the operator for evaluation.

Through use of the collaboration tool the resources drawn upon to develop a solution to a real-time wellbore problem were extended beyond both geographic and organizational boundaries. The problem was collaborated upon in real time by global experts resulting in the operations team in China being able to offer the operator a solution which was based on a much broader cumulative experience than could be accessed locally.

Figure 3. Responses to Underground Blowout



Wellbore Stability Problem

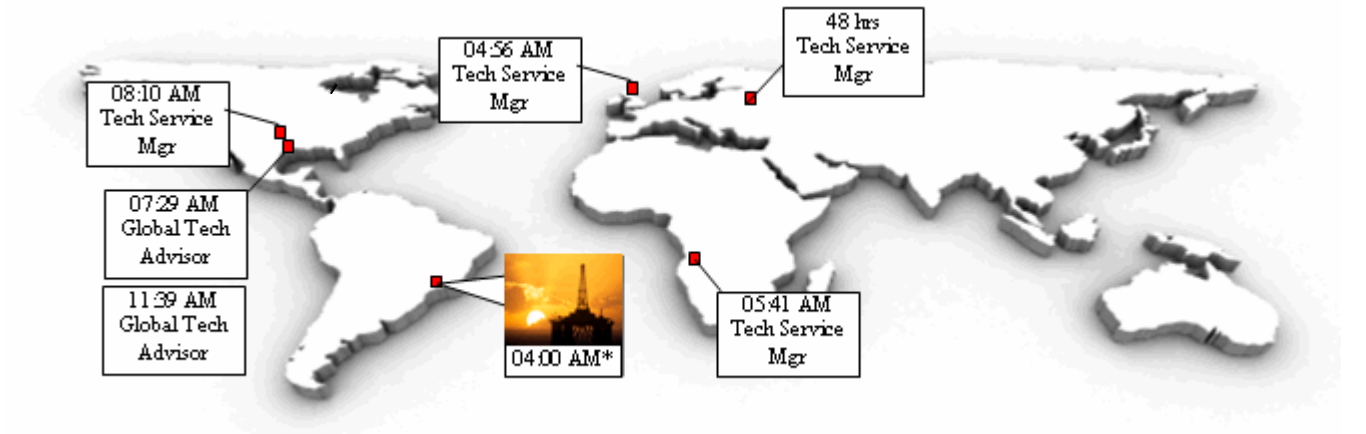
While drilling a well offshore Brazil an operator experienced considerable sloughing of shale. There was concern that the wellbore was becoming increasingly unstable and that the section might be lost and need to be re-drilled. Local technical representatives provided recommendations, but to ensure that the optimum solution was provided to the customer they posted a question on the global collaboration tool. Well configuration and formation information were shared along with all pertinent details of drilling parameters, drilling fluid properties and the symptoms of the issue. Recommendations were sought for immediate actions to counteract the issues being experienced.

- Six responses were shared by the community, 5 within 8 hours.
- Responses came from employees with diverse experience in diverse locations. A number of these responses were from acknowledged global experts in wellbore stability
- The collaboration highlighted drilling practices, drilling fluid solutions, tectonic factors and practical experiences in other locations.

Feedback from this collaboration was collated and passed to customer. Tripping practices on the rig were modified and modifications made to the drilling fluid formulation. The input from global collaboration was a key element in the decision process with the operator. Having put the recommended changes in place the well section was subsequently drilled and liner run successfully. Through real-time collaboration global expertise was focused on a live well issue and the problem solved efficiently. Figure 4 shows a schematic representation of this collaboration.

Looking outside of an established group can spark innovation of thought. The collaboration tool provides a connection to potentially unknown resources around the globe. A user can efficiently tap those resources to ensure the best possible products and processes are being recommended. All this can occur in real time and much more efficiently than utilizing other electronic measures.

Figure 4. Responses to Wellbore Stability Problem



Lessons Learned and Best Practices

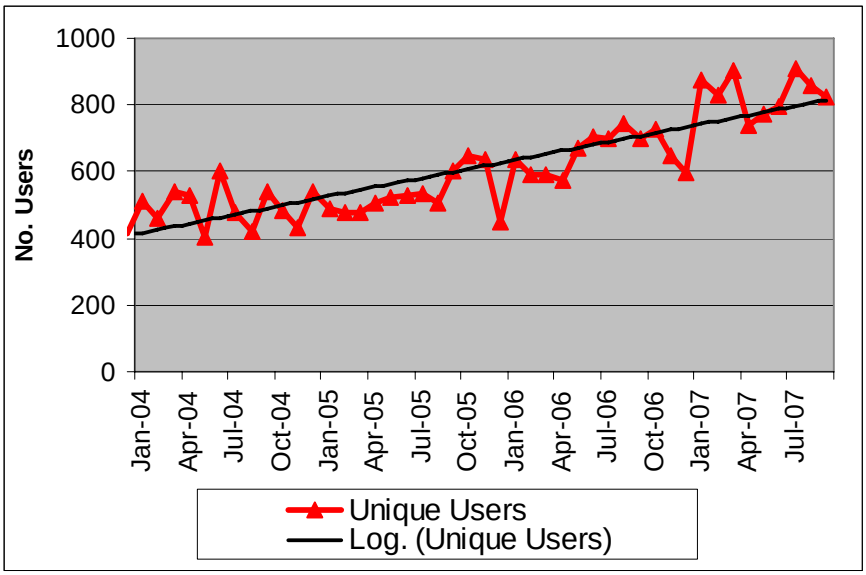
The Baroid Fluid Services Community has grown steadily since inception in late 2003. The initial planned target group was 400 unique users per month. This figure was exceeded a few months after inception and has continued to grow to current levels around 800-900 unique users per month. The total number of collaborative discussions has increased slightly over the lifetime of the community (see Figure 2). Some of the overall factors in ensuring the success of Halliburton KM communities have been discussed elsewhere[16]. Some of the key factors that we believe have contributed to the success of the Baroid Fluid Services community in addressing both real-time and longer term knowledge sharing issues are:

- Supporting collaboration with full time dedicated resources. The Knowledge Brokers dedicated to each community are fully focussed on making sure that questions receive answers in time. If no answers are naturally forthcoming it is their responsibility to make sure that suitable experts address an issue. This is a key benefit when collaboration occurs around live well issues and when an issue is time critical. A key role of the Knowledge Broker is to evangelize use of the collaboration tool and to encourage the participation of all employees in solution development and knowledge sharing. Where a community has no Knowledge Broker for a period of time the level of collaboration has been seen to reduce[17].

- Drawing on support at a local level. In each operational location a local knowledge champion has been selected. This employee not only supports and champions participation in collaborative solution development in that location they also monitor collaborative discussions and bring them to the attention of local experts in their location. Again, where issues are time critical the participation of local champions is particularly beneficial.

- Other key factors that have contributed to engaging the participation of employees in collaborative discussion are the alignment of the overall community Knowledge Management effort to the business strategy[18], the generation of a monthly report summarising key learnings from collaborative discussions and the engagement of management in the use of the collaboration tool as a means to communicate with the organization. Figure 5. shows the number of unique users who accessed collaboration per month. This number included both employees involved the operations of the product line and those employees from other product lines who accessed collaborations of the Baroid community. A greater the number employees engaged in routinely using the collaboration tool means a greater pool of resources to draw on to solve real-time well problems.

Figure 5. Number of users of the Baroid Fluid Services community collaboration tool per month



Conclusions

To help meet the challenges to the industry of increasing hydrocarbon demand, increasing well complexity, reduced employee experience levels and the large physical distances between operational centers a real time Knowledge Management collaboration tool has been used to enable users to solve real time well issues more efficiently through the availability of an extended network of experienced support. Through use of the tool an employee anywhere in the world can instantaneously initiate cross discipline collaborations to solve operational problems. All members of the global community can instanteously view and reply to discussions from all communities. The global distribution of the company's expertise means that there are experts able to respond to problems 24 hours a day.

As demonstrated in examples from Canada, where the use of this approach contributed to an HTHP well being saved, along with an estimated cost of $15 million, from China where urgent advice was delivered to a rig experiencing an underground blowout and from Brazil where global experts collaboratively contributed to solving a wellbore stability problem, the resources available to an individual employee are extended beyond any geographical or organizational boundaries, enabling them to access the experience and knowledge they need to be able to put the challenges they are facing, and data they hold, in context, to work smarter and to make better decisions.

The ability to engage employees with relevant knowledge and enable them to be able to contribute to solution development regardless of who they are, what department they work for, what language they speak and where in the world they are is considered a key benefit which compliments other improvements in digital technology which enhance our ability to access real-time data, remotely monitor data, and use smart or self-learning technologies. By bringing the right people with the right knowledge together with the right data, problem solving and decision making can be accelerated and the right solution can be provided at the right time.

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